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Issue #277

73

Amateur Radio's Technical Journal

A Wayne Green Publication

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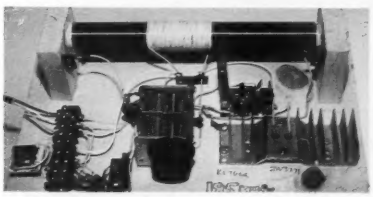

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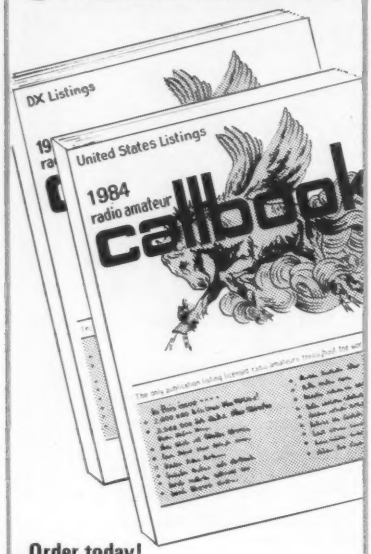

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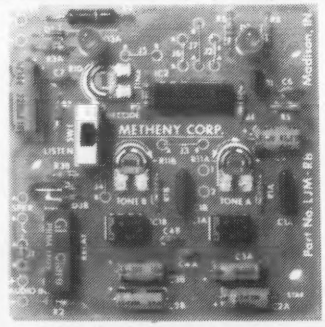

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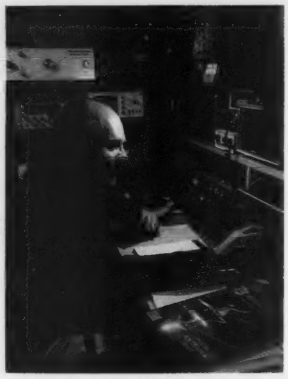

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

INSTANT GENIUS

Fast quiz: Which is the third largest consumer magazine in America? You may be surprised as I was to learn that *Folio*, the publishing magazine, has announced that *80 Micro* was in third place last year. Not bad for a magazine just two years old.

Vogue was second and *Byte* was in first place. So who conceived of and started two out of three of the largest consumer magazines in America? Yep! We're talking about me...the chap the League has been reviling for years.

Both magazines were original concepts. *Byte* was the first magazine about microcomputers and *80 Micro* was the first magazine devoted to a specific computer system. Both magazines have generated dozens of imitators. Now I have an idea for another completely new type of magazine, one which could be as successful as *Byte* and *80 Micro*. We'll be getting started with it as soon as I can find some people to help.

Just as *Byte* was a powerful force in helping the microcomputer field to grow, *80 Micro* has made it possible for hundreds of small firms to get started in support of the TRS-80 and grow to multi-million-dollar size. My predictions of eight years ago have come true: We've seen more new millionaires in the last few years than ever before in history...all because of microcomputers. And we really haven't seen anything yet.

The recent sale of my publishing firm to the *Computerworld* group for $60 million has generated some respect in ham circles. The gadfly and eccentric now gets listened to a little more attentively. Fine, for I have a message which should be heard. It's one I've been preaching for many, many years.

At the Atlanta hamfest in 1976, I remember trying to convince a small group of sullen hams that if they wanted to, they too could make any amount of money they desired. I pointed out that the microcomputer industry was just starting and that there was an unlimited potential for getting rich if they would only make the effort.

On the bright side, I've had letters from several hundred people who have read my editorials or listened to me talk, have followed my advice, and have become wealthy. That's not enough; I want to see thousands of millionaires, not just hundreds.

I was about 32 when I made my first million. I didn't protect myself against an unscrupulous partner, so first he screwed me out of my share of the firm and then, not knowing how to run the business, he bankrupted it. I was the real winner because I learned how to make money... he only learned how to lose it.

In 1964, I wrote a little booklet, *How To Make A Million*. I found that the America of the 60s was not the place to sell such a book. The kids then were more interested in dropping out and in drugs than in making money. I rewrote and expanded the book during a dull day in Khartoum in 1966, while on an around-the-world trip. One of these days I'll dust off and update the manuscript. The blueprint for getting rich in the book is as valid as ever.

In 1975, with the starting of *Byte*, I again got into the millionaire class, only to see it disappear one night...again lost because of my trusting someone.

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Programmable automatic band scan, and upper/lower scan limits; 5-kHz steps or larger.
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Built-in 16-key autopatch encoder.
Slide-lock battery pack.
Keyboard frequency selection.
Covers 143.900 to 148.995 MHz.

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- Complete with flexible antenna, 400 mAH Ni-Cd battery, and AC charger.

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- MS-1 13.8 VDC mobile stand/charger/power supply.
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- TU-1 Programmable CTCSS encoder (TR-2500 only).
- TU-35B Programmable CTCSS encoder (mounts inside TR-3500 only).
- PB-25H Heavy-duty 490 mAH Ni-Cd battery pack.
- DC-25 13.8 VDC adapter.
- BT-1 Battery case for AA manganese/alkaline cells.
- SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.

TR-3500

70 CM FM Handheld
- Covers 440-449.995 MHz in 5-kHz steps.
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- WS-1 Wrist strap.
- EP-1 Earphone.

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g LCD, Big 45 W, Big memories, Compact.

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- Repeater reverse switch. (Locking)
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- Compact lightweight design.

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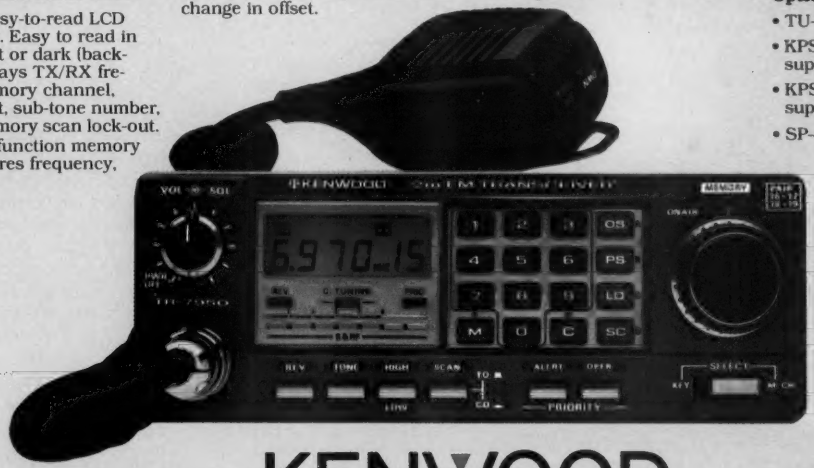
- TU-79 three frequency tone unit.
- KPS-12 fixed-station power supply for TR-7950.
- KPS-7A fixed-station power supply for TR-7930.
- SP-40 compact mobile speaker.



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This amplifier is designed for use with hand-held transceivers in either mobile or fixed station configurations.
Because of its light weight and compact size, the LA-2035 can be mounted under the dash, under the seat, or in any other convenient location.
The LA-2035 is equipped with RF activated stand by circuitry.
Easy operation. Simply connect your antenna and your hand-held to the LA-2035. Connect the LA-2035 to a suitable power supply and go.

Specifications
Band: 144-148 MHz
Mode: FM/CW/SSB
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Maximum output power: 30 watts plus.
Power consumption: 13.8VDC at 5A. Max.
Dimensions: 100W×35H×125Dm/m
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QSL OF THE MONTH

From high tech to soft tech is the theme of this month's winning QSL card. Ohio's Michael Bryce WB8VGE has taken advantage of the freebies given to us by Mother Nature and used them to power his station. The card depicts a solar panel and a wind generator, Michael's two sources of energy. So when you hear WB8VGE say he is just shooting the breeze, you better believe it.

If you think your QSL card is a winner, put it in an envelope with your choice of a book from 73's Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be considered.

So, grumbling a lot, I started in again.

Now my goal is a billion. Oh, that's more of a side goal, since money has never been important for me. My real goal has been to provide education and entertainment for as many people as possible. But to do that I have to make money, so that goal has been inescapable.

A billion? Sure! And one thing is certain: To reach that goal, I'll help make several thousand millionaires along the way. The secret is simple: Figure out what is coming up next in technology, run quickly to the front of the parade, and then try to lead it.

For instance, I see the time not far ahead when education is going to be a marketable product. To get ready to take advantage of that concept, I'm now in the process of starting a college. This will escalate into an educational cable television network. The last step is interactive education on video disk which can be sold anywhere in the world. That's where most of my $60 million is going to be invested.

Since I feel that amateur radio is a key element in bootstrapping our country into technology, I'm going to be working hard to see that amateur radio gets into a strong growth pattern. Old-time hams who would prefer to see fewer hams and thus less interference on the bands are going to have a fight on their hands since I'm aiming for two million licensed hams by 1990.

Interference? Poo. With high-speed digital technology, we'll have far less interference than we do today. Indeed, I think we can develop some communications techniques which will be error-free and virtually instantaneous anywhere in the world.

One of the bonuses of success is that it is a lot easier to be heard. The incentive licensing debacle of 1963 kept me and *73* impoverished as the growth of amateur radio stopped for ten years. The disaster threw virtually every ham manufacturer out of business. If *73* had been stronger, I might have had the muscle to stop the debacle instead of just reducing its impact.

You've read about the FCC's Long-Range Planning Committee. The goal of this group is to help develop an emergency communications system for America which will be capable of surviving even an atomic attack. I think this can be done...and that amateur radio can do it. But I'm not talking about a handful of HTs and some surviving repeaters or 80-meter traffic nets using Morse code.

Several years ago, I pointed out in an editorial that a dependable emergency communications system would be a powerful deterrent to nuclear attack. Reagan has said the same thing recently, which sort of puts the ball in our court. Right?

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With these modified Beverage antennas, you double your directions without doubling your cost.

"Oh my, he's weak, Egads, what static. Oh well, let's turn the beam and see where he peaks up."

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An Old Antenna

First described in a 1922 article by H. H. Beverage,[1] the Beverage is a receiving antenna described by one friend as an antenna that works poorly in general, but less poorly in one direction. Its principal advantages are:

- It increases your received signal-to-noise ratio (reduces QRN) for low-angle signals (i.e., DX!).
- It has a narrower beamwidth than typical 80-meter antennas. Belrose VE2CV has described the azimuthal beamwidth as 77 degrees.[2]
- It is much less susceptible to precipitation static, so that a snowstorm in February is less likely to shut down low-frequency operations.
- It is capable of excellent front-to-side performance to reject all that static coming from around the equator.
- It reduces the need for inserting attenuation to protect the solid-state front end of your receiver or transceiver.
- If you live in the Northeast, it will quiet down all that QRM generated by those very loud W3, W4, and W8 stations who insist that they have a right to the band, too. It is not unusual to see 20-25 dB front-to-back.

A Beverage is a single-wire antenna used in receiving only. It is end-fed, 1/2 to 4 wavelengths long, strung horizontally from 6 to 15 feet above ground. Many Beverages are fed at one end, left open-circuited at the other, far end, and are bi-directional in line with the wire (see Fig. 1). Adding a terminating resistor to the far end, as in Fig. 2, makes the Beverage unidirectional, but you can't switch directions. Some Beverage users use a dc relay and switch the terminating resistor in and out, but this still does not provide unidirectional performance in each direction.[4,5,6,7]

However, if you go one step further—feed both ends of a Beverage, select either feedline and terminate the other—you can indeed have two directions from a single wire. This is what we have done, not with just one wire, but three, for six directions!

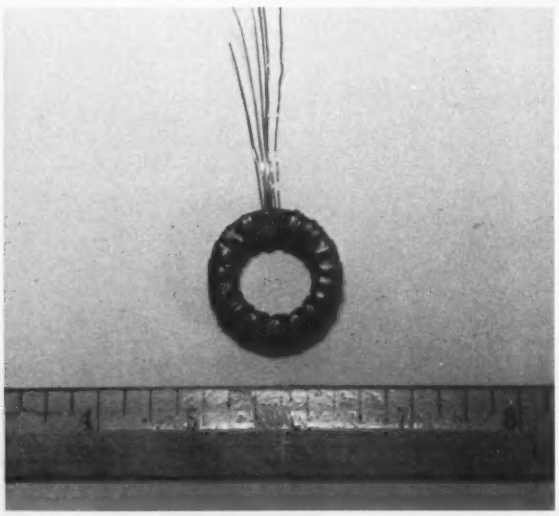

Photo A. View of toroidal matching transformer, showing method of winding.

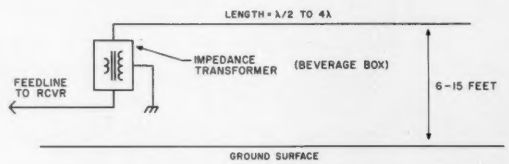

Fig. 1. A basic Beverage antenna. The directivity pattern is bi-directional along the axis of the horizontal wire. The Beverage Box contains a transformer which matches the impedance of the antenna to the impedance of the feedline.

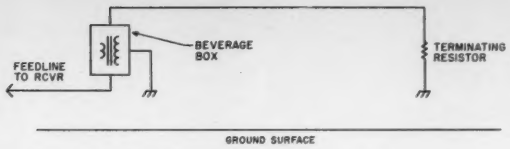

Fig. 2. A terminated Beverage is unidirectional toward the terminated end of the antenna. The resistor is a noninductive type, and experience suggests a value between 300 and 800 Ohms.

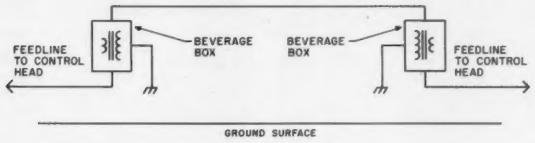

Fig. 3. The directivity pattern of the K1VR/N1RC Beverage is reversible. A control head at the operating position selects one of the two feedlines and routes it to the receiver while terminating the second feedline with a resistance. The antenna is directional toward the end with the terminated feedline. By using three such antennas and a rotary switch, six different directions can be selected.

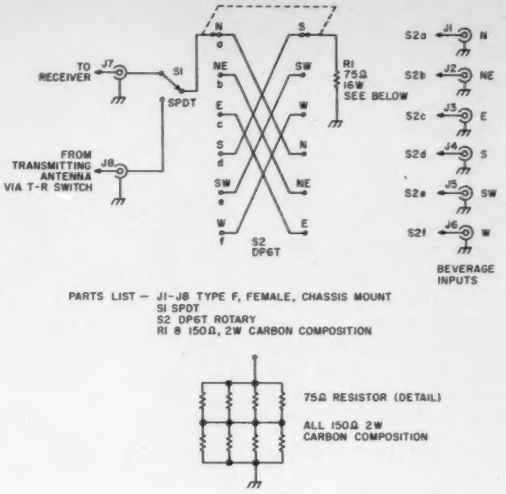

Fig. 4. Control-head schematic diagram.

A New Construction

The form of construction described in this article is desirable because few of us live on a piece of land large enough to stretch out a Beverage in each desired direction. But if you can have *one* wire, you can have *two* directions!

The system has the following components: a control head in the shack, three Beverages, six feedlines, and six "Beverage Boxes."

The control head has two switches: A Beverages/transmit antenna switch (to select the transmit antenna to listen on, if desired), and a rotary switch for selecting a favored direction.

Outdoors, we used three Beverages, which we strung between trees, but more or fewer can be used. Each end of each Beverage wire is connected through a Beverage Box to one of the feedlines. See Fig. 3. All feedlines end in the shack at the control head. Our Beverages range from 220 to 325 feet long, limited by the size of K1VR's yard.

It sounds simple because it is simple. Results: improved signal-to-noise, front-to-back, and front-to-side operation when compared with dipoles and delta loops. And you thought you couldn't rotate an 80-meter antenna!

The Control Head

In the original control head, the transmitting antenna was assigned position number 1 on the rotary switch. With a little experience, however, we soon learned that comparing reception on the Beverage to reception on the transmitting antenna was much easier with a separate toggle switch. In addition, the rotary switch had a nice even number of positions, with no empty space opposite the transmitting antenna.

The double-pole, six-throw (DP6T) rotary switch we used was the type that lets you select the number of positions desired by successively removing stops. We "crosswired" the switch as shown in Fig. 4, so that when one feedline is selected, the feedline coming from the opposite end of the same Beverage is connected to the 75-Ohm terminating resistor. Thus, if we select, say, the northeast end of Beverage A, then the southwest end of Beverage A is terminated.

Pay close attention to the wiring and labelling, or you will surely have to rewire several times, as we did, to make the switch go nicely around the compass, terminating the other end of the direction selected.

In locating the control head at the operating position, remember that while you may change bands only two or three times per hour at most, you will change directions for receiving repeatedly. So choose a location near the transceiver dial or antenna rotator, to be used by the hand you do *not* write with. The control head should also be plainly visible, so that you won't strain to hear someone only because you've forgotten to "point" the right antenna at him (or her!).

We used F connectors because they are cheap, readily available, take up much less back panel space than UHF connectors, and are much, much easier to install (a single 5/8" hole)! BNC connectors would also be appropriate. But note it is a good idea not to use a connector which may also be used in a transmitting application in your shack. Remember, Beverage antennas are for receiving only!

Finally, as we got around to attaching feedlines, it became apparent that as soon as they were identified, it was important to label them with Brady markers, tie-wrap tabs, or even masking tape to indicate direction. Without marking, eight identical RG-59 ends with F connectors quickly became confusing.

The jumper connecting the control head to the transceiver at K1VR was RG-59 with an F connector on one end and an RCA phono plug on the other. This was due to the need for RCA plugs in the Kenwood TS-520, 820, 830 series. Note that a small modification may be necessary to your transceiver to permit operation with a separate receiving antenna while maintaining the flexibility of switching back to the transmit antenna for receiving, if desired.

Feedline

Of course, the magic in the design of these antennas is that the feedlines are so inexpensive. With the advent of cable TV, so-called "drop cable" has become widely available at very attractive prices. This is the cable which is run from the telephone pole on the street to the home.

Drop cable comes in two sizes: RG-59 and RG-6. At 5 MHz, RG-59 has an attenuation of approximately .55 dB/100 feet; RG-6, which is more expensive, is approximately .45 dB/100 feet (source: Belden catalog). Therefore, since loss is inconsequential (the more feedline loss, the less attenuation you will have to insert to prevent front-end overload), choose the line on which you get the best deal. However, other considerations may contribute to your decision.

If you live near a strong local station or intend to operate in the multi-operator/multi-transmitter category in various contests, you may wish to consider the question of shielding. RG-59 is commonly available in 40% braid/100% foil or 60% braid/100% foil. The more ingress of signal that you expect, the more you should consider using 60% braid or even 95% braid. *In extremis,* these cables are also available with double shielding and double foil. Double-braided RG-6 is the cable of choice for direct burial installations.

In any ham station, the question of splicing wire often arises. A few words of advice are appropriate. If you have to put a cable in conduit to get out of your house and into the backyard, *never* put a splice inside the conduit. If you must splice outdoors, splicing and then putting the splice underground is bad business, as it is just too susceptible to water getting into the coax. Since this is a foam coax, the water will migrate without mercy. The coax is cheap; if you value your time at all, use unbroken runs of coax in conduit and underground!

Finally, when working with cable-TV coax, remember that the braid is generally going to be made of aluminum and will not solder. This dictates that all connectors must be either crimp-on BNC or crimp-on F. As for the crimping, it may be awkward, but be sure to borrow or buy the correct crimping tool. Merely using a pair of pliers will not do the kind of rf-tight crimp which will last.

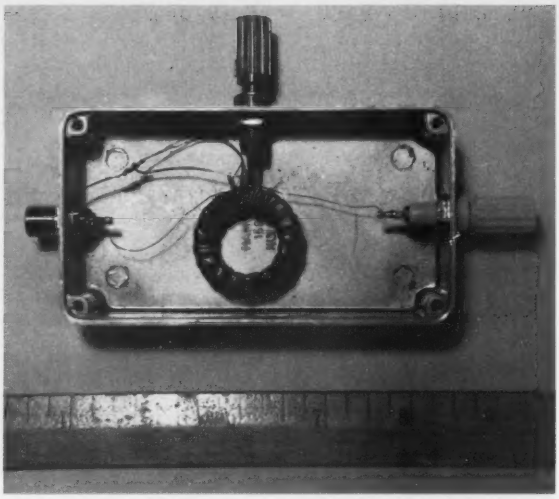

Photo B. Inside view of a Beverage Box.

Beverage Boxes (The Terminations)

The Beverage Box is the interface between one end of a Beverage antenna and its 75-Ohm transmission line. It should have minimum insertion loss, operate efficiently over a wide frequency range, and be weatherproof.

As a starting point, we knew that, according to the literature, Beverage impedances could range from 400 to 800 Ohms or so, but that we could reasonably expect an impedance in the 500–600-Ohm range.[10,11] Furthermore, we decided that rather than design a multiple-impedance matching transformer, a single 600-Ohm-to-75-Ohm design would be used. The thought of many treks into the woods to adjust taps aided in this decision!

The actual construction of the box was divided into smaller units of decision-making.

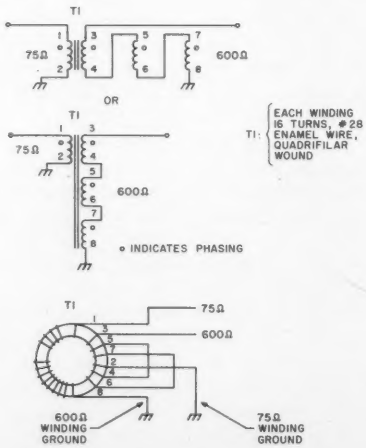

Fig. 5. Transformer winding details.

Connectors

F connectors were selected for the very same reasons we used them in the control head.

Also, watertight boots which go over F connectors are readily available. Filling them with silicone grease (not caulk) before tightening will make a very good setup. Remember to put the boot on before putting on the F connector. The authors have forgotten this rule more than once.

Binding Posts

We selected commonly-available posts and have very little to contribute to the discussion. However, it is a good idea to get the type with a hole through the post to ensure a good contact even after oxidation has begun. Also, note that some binding posts (the cheapest type) are not feedthrough types. That is, they are not insulated from the surface in which they are mounted. These should be avoided.

The Transformer

The transformer design meets the following criteria:

Impedance Ratio (Ohms)	600:75 (8:1)
Bandwidth	1.0 to 30 MHz
Insertion Loss	Negligible

The transformer was quadrifilar wound (Fig. 5), one winding serving as the 75-Ohm secondary, the other windings connected in series as the 600-Ohm primary. All windings were 16 turns, #28 enamel wire, close-wound (Photo A), on an Indiana General 626-12-Q1 core (available from Permag Northeast Corp., 10 Fortune Drive, Billerica MA 01865; (617)-273-2890). Each winding had a self-impedance of 375 Ohms (5 × 75). The core of the transformer had a .75″ inner diameter, a 1.25″ outer diameter, and a .375″ width.

Note that the late Jim Lawson W2PV found that in the presence of very high rf levels—a local AM radio

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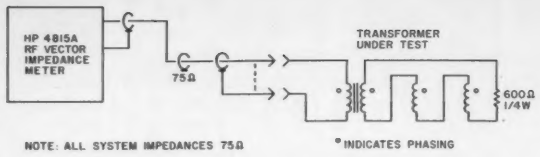

Fig. 6. Impedance-measurement test setup.

F(MHz)	Z (Ohms)	θ°
1.8	70	+6
2.0	70	+6
3.5	70	0
4.0	71	0
7.0	68	+2
7.3	67	+2
14.0	56	−2
14.35	54	−4
21.0	42	+8
21.5	42	+9
28.0	38	+30
28.5	37	+37

Table 1. Transformer vector-impedance measurements.

station—the toroid core saturated. He used L/C networks for transformers instead of toroids at his location.

Both a network analyzer and an rf-vector impedance meter (75-Ohm impedance) were used to verify transformer performances. Test setups are shown in Figs. 6 and 7; measurements are listed in Tables 1 and 2. Measurements made using the network analyzer are return loss as measured in decibels. "Return loss is the relation between the power returning down the line from a mismatched load to the power incident to that load." (Stephen F. Adam, "Microwave Theory and Applications," Prentice Hall, 1969.) It is related to vswr by the formula: $R1 = -20 \log_{10}(\text{vswr} - 1/\text{vswr} + 1)$. Equivalent vswr's are included in Table 2.

All measurements were made with the transformer terminated in a 600-Ohm load consisting of two 1200-Ohm, quarter-Watt, carbon composition resistors in parallel.

N1RC also tried a measurement setup which the average ham can do at home to get a rough indication of Beverage performance. Although the transformer is designed for a 600-Ohm-to-75-Ohm impedance transformation (an 8:1 ratio), it can also be used for 400-Ohm-to-50-Ohm applications. Bob made a 400-Ohm dummy load of 8-50-Ohm, 10-Watt wirewound resistors and connected it to the 600-Ohm side of the transformer. After connecting the 75-Ohm side to the "Antenna" connector of a vswr bridge and applying enough power to get a full-scale deflection, he measured the vswr (quickly!) on 160, 80, and 40 meters. It was 1.5, 2, and 3, respectively, and into a reactive load.

Winding Tips

Leave about three inches of wire free on each end of each winding. Tin each end for about 1/4"; remove the enamel by burning it off with a hot soldering iron. Wipe the tip of the iron frequently on a wet sponge to clean it. When all eight ends are tinned, identify each winding using a continuity tester or VOM. Separate out one winding as the 75-Ohm winding. Carefully solder the other three windings in series, removing excess wire (you don't need six inches), and re-tin ends before connecting the two end windings to the center windings. Pay careful attention to polarity (phasing).

Box Assembly

Each transformer is mounted in the Beverage Box on a platform built up of clear uncured RTV. When this cures, the toroid will be held securely in place. The ground ends of the windings are connected together to the ground binding post and a chassis ground. The 75-Ohm and 600-Ohm windings

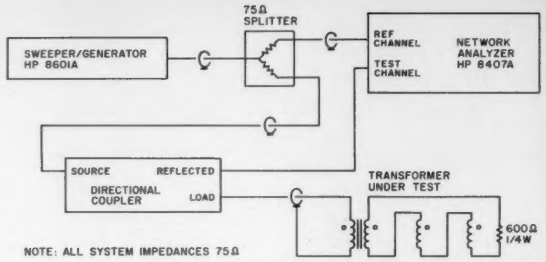

Fig. 7. Transformer return-loss test setup.

are connected to the F connector and input binding post, respectively. See Photo B. Be careful not to reverse these connections as we did in one box. If you need to identify windings, disconnect the ground ends from ground and from each other. The 600-Ohm winding will then show continuity from the "hot" end to the connections between its center winding and outer windings.

Another consideration is the location of the 600-Ohm binding post, the 75-Ohm binding post, and the F connector. We placed the 600-Ohm binding post and the F connector on opposite ends of the long axis of the Beverage Box with the ground binding post placed on the side. In this way, the box could be "hung" from a Beverage. The F connector and 75-Ohm feedline hang vertically from the bottom of the box with no right angle bends in the cable and a natural drip path for the water off the box.

The Box

We chose an aluminum Hammond 1590 B box (109 × 58 × 25 mm), equivalent to Bud box number CU 124, because it was reasonably priced—in the $6.00 area—and had an inner lip which protects the circuitry from the weather. All seams in the box and connectors were coated with clear nail polish to form an inexpensive and watertight seal. Photo C shows a completed box.

Grounding

This is a subject all its own. But it is probably worth a few words here. The Beverage antenna will be erected only 8-15 feet off the ground. Therefore, it is unlikely to receive a direct hit from lightning.

F(MHz)	Return Loss (dB)	Vswr
1	20	1.22
2	30	1.06
2.7*	45	1.01
3	35	1.04
4	30	1.06
5	28	1.08
6	25	1.12
7	22	1.17
8	20	1.22
9	19	1.25
10	18	1.28
11	17	1.34
12	16	1.38
13	16	1.38
14	16	1.38
15-30	> 10	< 1.9

*Resonance in transformer produced (out of ham band) measurement anomaly.

Table 2. Transformer return-loss measurements.

To a certain extent, the feedlines to the Beverage Boxes act as counterpoises, since the most convenient route from the shack to the Beverage Boxes furthest from the shack was almost always along the ground beneath the Beverages. All feedline braids were grounded at each end. However, this counterpoise effect caused by the feedlines is not a designed-in part of the Beverage system and cannot be depended upon to either improve or degrade system performance. It just must be accepted as one result of this design.

In the installation of this antenna, several four-foot cable-TV ground rods were

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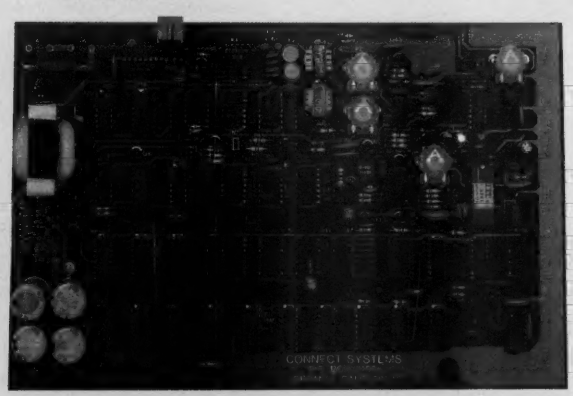

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used. In addition, several six- and eight-foot ground rods were used. Six-foot-by-3/8-inch or eight-foot-by-5/8-inch ground rods seem to be the grounding system of choice. But the best strategy seems to be this: Erect something, and if you are unsatisfied with performance, go out and add more ground rods a few feet away or add radials to the existing ground rod.

Incidentally, since no #6 copper ground wire was available, we simply used two strands of #12 (approximately equivalent to one #9 wire) to ground the termination boxes.

Place the ground rod a few feet away from the tree and you will have a better chance of avoiding thick roots when you drive the rod(s) into the ground.

Note that a six-direction Beverage system uses seven ground rods; the last one is for ground back at the shack. But you have already installed a good ground for your station, haven't you?

Wire and Height

Beverages will work best, it seems, at heights from 6 to 15 feet. Above that, they begin to look like conventional longwires. We caution you to put the wire up at least 10 feet, however, because one Massachusetts ham is now the defendant in a lawsuit resulting from a trespasser on horseback who was toppled from her horse when she hit the Beverage wire.

At K1VR, due to constraints imposed by lot size, the Beverages were only between 220 and 325 feet long. Widely-circulated folklore suggests that two wavelengths, or 450 feet at 80 meters, is optimum. There is some experience, at W4BVV and W1ZA, to suggest that 1000-1200 feet is too long at 80 meters.

Almost any wire will do, but we recommend stranded and insulated, approximately #16 or #18 AWG. Finally, if you want the wire to be seen, because you cross an open field perhaps, make it white or yellow. On the other hand, if you live in a more suburban area and wish to hide it a bit, choose green, brown, or black insulation.

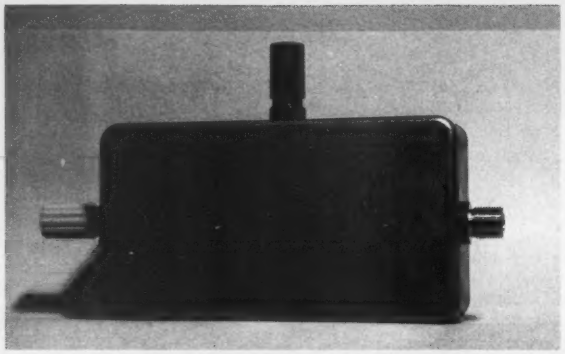

Photo C. Assembled and sealed Beverage Box. The system of three reversible Beverages at K1VR required six of these boxes.

The best mounting method yet discovered is to use standard electric fence wire standoff insulators made of plastic. They can be hammered into a tree in seconds.

Remember, when installing your wire, to keep it as far away as possible from towers and other metallic structures which may have the undesired effect of capacitive coupling. In the case where a 300-foot wire is supported in the middle by your tower, it is more likely to behave as if it were a 150-foot wire.

We chose stranded wire because, over such long runs, supported by trees, a solid wire would be flexed frequently, leading to stretching and breakage.

Conclusions

We set out to make a unidirectional receiving antenna for the low bands which would be very good for DX and reject signals from the side and back. For a modest amount of work, on a lot of modest size, we attained that goal.

Once we had the antennas up and working, we did notice something about their operation that deserved a bit of attention. Occasionally a signal seemed to peak on the wrong antenna. There are two reasons that this can occur. For one, a particular Beverage may not so much favor one direction as it nulls the interference coming from another. This gives the *appearance* of peaking a signal on the wrong antenna. In trying conditions, this means that some judicious switching is worthwhile. For another, Beverages are essentially low-angle antennas. As a result, a close (0-300 miles) station may actually be louder on the high-angle side lobe of a completely different direction Beverage than on the Beverage favoring that direction. At K1VR, this means that K2s often peak north or northeast. Locals, it seems, can peak almost anywhere.

Having established that we had a working antenna system and knowing full well that nothing good ever lasts, we decided to make records of baseline resistance measurements at the control head. There is variation due to feedline lengths, and maybe even grounding, but by measuring between the center conductor and ground at the output of the control head (removing the jumper that goes to the receiver), lines measured between 6 and 40 Ohms.

It is really neat to peak up the weak ones and reject the strong ones by changing directions so easily. If you've long bemoaned the noise and crud on 40, 80, and 160, try a Beverage and double your fun by feeding both ends!

Acknowledgments

Thanks to W1CF who erected the prototype version on Martha's Vineyard. And thanks to W1FC who took the first cut at designing the transformer. Both men work at M/A-COM, where we used some lab instruments for testing. Thanks also to N1BC for some helpful hints. K1VR thanks his company, Channel One, for offering a good deal on some RG-59 left over from satellite cable-TV installations.

We would be happy to respond to any inquiries accompanied by an SASE. ■

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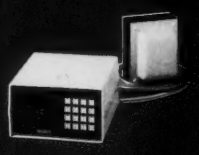

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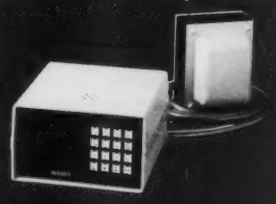

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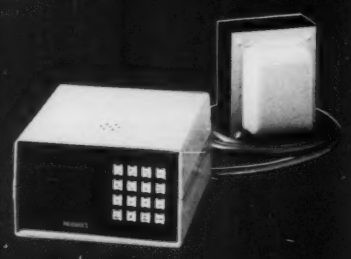

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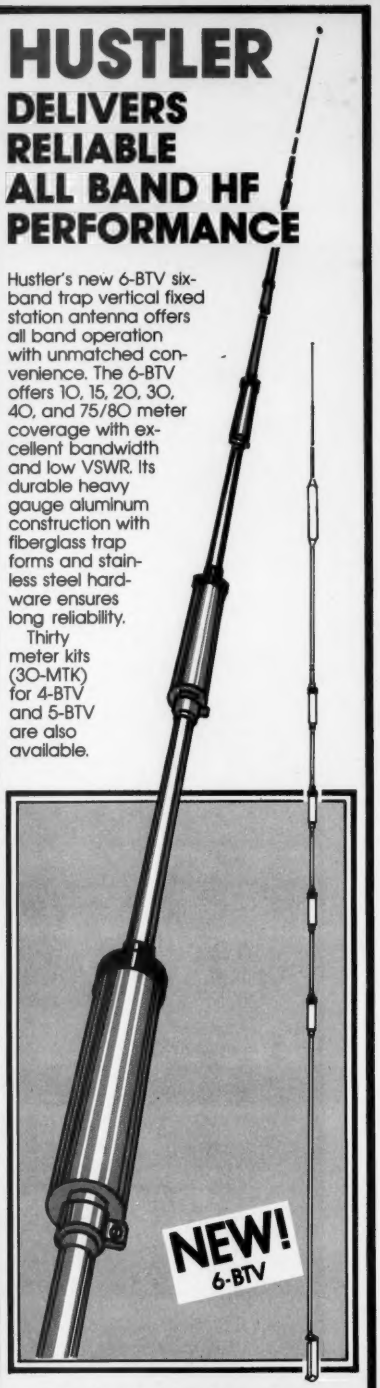

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Last month, a general overview of packet radio was presented. This time, a detailed description of the Tucson Amateur Packet Radio (TAPR) Terminal Node Controller (TNC) will be presented. I will do this in detail to allow the experienced home-brew artist to construct one, and I will make general comments regarding packet hardware. A look at current and projected packet activities will be included, along with references to sources of further information.

As explained in Part 1, most packeteers utilize a TNC to connect their radio and terminal or computer together. The TNC contains a microprocessor, memory, I/O for the terminal (from now on, the word terminal will be used to include a personal computer), I/O for the radio (including the modem, or TU), a power supply, and miscellaneous circuitry.

There are at present two TNCs in common use. One is supplied as a bare board from the Vancouver Amateur Digital Communications Group (VADCG) and was the first system generally available. It has 4K bytes of RAM space and 4K bytes of EPROM space. The 8085 microprocessor is utilized, along with the 8273 HDLC controller. An external power supply and modem are required for operation. (Contact VADCG, whose address appears at the end of this article, for more information.)

The second unit is a TNC designed by TAPR (pronounced "tapper"), and it includes 24K bytes of EPROM, 6K bytes of RAM, a 6809 microprocessor, and a Western Digital 1933 HDLC controller. It supports both serial and parallel terminal I/O and includes an on-board modem (with radio interface circuitry) as well as an on-board regulated power supply. The primary emphasis of this article is on building a TAPR TNC.

Short History of TAPR

The TAPR TNC came into being after a group of six hams got together in late November, 1981, following a presentation on packet radio by KD2S at the local IEEE Computer Society. After reviewing the October, 1981, *QST* article on packet radio, the group decided to get further involved. Wanting to do extensive experimentation with various protocols and desiring that the TNC be self-contained (with on-board modem, radio interface, and power supply), an informal club was formed and the name Tucson Amateur Packet Radio adopted.

An initial TNC design using a 6502 microprocessor was completed in December of 1981, and by late winter, a dozen PC boards were fabricated. These were called alpha boards, and the twelve people who had ordered them hurriedly assembled them. The software and protocol groups meanwhile got very busy, but work (the bane of an amateur's existence) got in the way and things developed rather slowly. The original boards had 12K bytes of EPROM, 4K bytes of RAM—and some very troublesome IC sockets.

By May, 1982, a FORTH compiler was resident on the TNC and some fairly crude software to exercise the hardware and ship packets was written. This system was first shown publicly at the ARRL Southwestern Division Convention, June 4–6. By this time, TAPR was a nonprofit R & D corporation with over 100 members. Shortly after the convention, stations WA7GXD and KD2S established packet communications over a 35-mile path in Tucson using the alpha TNC.

Investigation into the radio response characteristics of the 2-meter gear available to TAPR that summer showed that the audio response on a system basis (that is, looking at a signal from a receiver's speaker that was transmitted by another radio with a pure signal at its microphone input) was terrible. If the modem was to work at the tar-

get rate of 1200 baud, some filtering was going to be needed.

At this time, KV7B and KV7D stepped forward and volunteered to design such a filter. After careful study and computer simulation (meaning building and testing it on paper as opposed to actually doing it), a design came forth which was quickly breadboarded. On the second pass, it worked! Several radios were tested with the new filter, and most worked perfectly.

About the same time, the software people requested more memory space and an improved microprocessor. The 6809 was selected, and memory space increased to 24K bytes of EPROM and 6K bytes of RAM. And, again at the same time, an experiment believed to be unique in the annals of amateur radio history was launched...

Beta Test

It was a fundamental belief amongst the original TAPRites that unless packet were made available to the general amateur community as a tested and proven mode of communications, it would become at best a curiosity—like SSTV—rather than a dominant mode whose advantages could be readily exploited—like VHF FM. Thus, it was determined to do an extensive, nationwide test of the TNC design, both establishing it technically and creating a widespread organization with packet experience and expertise. We felt that in this way thousands of amateurs would get exposed to the new mode, see demonstrations, etc., and the TNC could be tested in a variety of climates and by people with all sorts of backgrounds, many nontechnical.

TAPR announced its intentions via its newsletter, *Packet Status Register*, and the *AMRAD Newsletter* (published by Amateur Radio Research and Development). By the cutoff date, over 160 amateurs agreed to participate in the test. It was made clear that a true test was to be done evaluating protocols, hardware, etc., that problems could be expected, and that solutions would have to come from the field, not just the Tucson "core."

In October of 1982, AMSAT sponsored a conference to decide protocol issues so the forthcoming Phase IIIB satellite could be used for intergroup-linking experiments. It was apparent that a standardized protocol was needed, or else different groups would not be able to exchange information. A sort of Tower of Babel would result, with each group speaking its own language. The result of this conference was the adoption of a protocol called AX.25, sponsored by AMRAD, with a few changes.

At TAPR, a software effort was organized to get this new protocol on the beta boards, and the race was on between the PASCAL coders with AX.25 and the FORTH coders with the TAPR/DA (dynamic addressing) protocol. The AX.25 team won the first round, and the resultant TAPR/AMSAT AX.25 protocol was burned into the TNC's memory.

After a false start in which 119 TNCs had to be scrapped due to a manufacturing defect in the PC board (see "Black Thursday" in the December, 1982, issue of TAPR's *Packet Status Register*), the beta TNCs were distributed. In a matter of a few short weeks, beta sites were on the air with packet beginning a rigorous test of hardware, software, and protocol. As this is being written, the first results of the beta test are flowing in, and by the time you read this, it is expected that the bugs will largely be exterminated in the software and hardware design modifications for enhanced operation will have been implemented.

The TNC

The information presented here for constructing a TNC is based on the latest hardware modifications. Be sure to contact TAPR for any updates before you begin building your unit just to be safe (please include an SASE), but you may be assured that the design presented here has in fact been put on the air by over 160 other hams and that it works very well.

CURRENT PACKET ACTIVITIES

Packet radio development is currently expanding in many directions:

On HF, transcontinental contacts have been made as well as short-distance ones, on 10 meters. AMRAD is sponsoring the design of a Packet Adaptive Modem (PAM) especially for HF use. It will work from 75 to 1200 baud using FSK techniques. The idea is that stations will establish contact at 75 baud and then step up the rate until the bit-error rate (BER) becomes too high (meaning too many retries). The units then will step down in rate and continue until either (a) the error rate degrades, meaning another step downward, or (b) the error rate becomes too good, meaning another step upward.

Another set of experiments has been conducted by W9JD using a scheme of forward error-correction (FEC). This means that redundant bits are sent for each character, slowing down the data rate for a given baud rate but allowing the receiving station to miss some bits and still get error-free copy! This sort of system no doubt will be further developed in the future.

On VHF, W3IWI and others have exchanged packets using OSCAR 8 Mode J! This is a precursor for the AMICON network to be established since the successful launch of Phase IIIB. TAPR is starting to design high-speed linking hardware for the Terracon application.

One of the most original experiments now being implemented is a device called PACSAT. This is an AMSAT-sponsored satellite that will fly in low Earth orbit (LEO) much as the present OSCAR series. However, this bird will have up to 4 megabytes of memory and will allow amateurs to send messages to other amateurs anywhere else on Earth. PACSAT will store the message until the receiving amateur logs in, at which time it will send the message to him. This store-and-forward system will allow non-real-time communications on a global scale. PACSAT is slated to fly in the 1985/6 time frame.

Back on the ground, several sites have put up computer bulletin boards on packet. The list includes San Francisco, St. Louis, Tucson, Washington DC, and many other cities.

A major breakthrough in packet communications occurred during October, 1982, when AMSAT sponsored a protocol meeting in conjunction with their annual meeting in Washington DC. Locked in a room until an agreement was reached, representatives from most active US packet groups met and adopted a "level two" protocol. This means that nearly every packet group will be running a common protocol, enabling us to "talk" to each other now that Phase IIIB is up! While seemingly perfectly obvious, such an accord will help prevent a Tower of Babel, allowing experimentation with access and modulation techniques for this satellite. Of course, each group can run whatever protocol they like locally, but most are now running the AX.25 protocol adopted at the Washington meeting.

As you can see, there is no lack of things being done with packet now, nor will there be in the foreseeable future. In fact, it is my opinion that the next year or so will see the beginning of traffic handling and emergency-communications-oriented amateurs reaping the benefits of packet-radio techniques.

The TNC design is broken into the areas of microcomputer terminal I/O, radio I/O and modem, and power supply. These will be discussed in some detail, and it is recommended that the builder thoroughly read this section before construction commences. The TAPR TNC incorporates some very new technology, some of it believed to be unique in the Amateur Radio Service.

NOVRAM (a trademark of Xicor) is a form of memory (nonvolatile) that doesn't forget when power is removed yet is easily updated by the operator. It is used to store such information as station callsign, terminal I/O characteristics (baud rate, parity, and stop bit options, etc.), radio channel information, and so forth.

A CMOS switched capacitor filter is used to smooth the radio system audio response to allow for a 1200-baud transfer rate. This filter is crystal-controlled, and its parameters are set by a network of 1% resistors so that it is economical (about $6 total) as well as reproducible (there are no adjustments nor critical capacitors).

"Byte-wide" memory is used, so the user can optionally mix the ratio of RAM and EPROM, and the address map for the microcomputer is burned into a TTL PROM, so it can be changed by those who so desire.

Other unique features include a 14-second "watchdog" timer to prevent a malfunctioning unit from tying up a channel, on-board self-calibration routines for setting the modem frequencies, and capability to select the HDLC baud rate under software control.

The Microcomputer

The TNC digital logic is implemented via a programmable microcomputer. This allows changes to be made in the logic (such as protocol definition) without modifying the board and greatly simplifies the device. To implement a TNC in discrete logic (such as TTL or CMOS ICs) would be an incredibly complex task and probably would render packet an unusable mode.

The design of the microcomputer portion of the TNC is very conventional. A crystal-controlled clock oscillator is implemented using two sections of a hex inverter, U1. The frequency chosen, 3.6864 MHz, enables the various baud-rate generators on the board to operate exactly at the standard baud rates in general use. A frequency divider follows the clock oscillator to provide a 1.8432-MHz signal for the 6551 UART (see User I/O, below) as well as a 115.6-kHz signal needed by the switched capacitor filter in the modem, described below.

A reset circuit is provided using two sections of a hex Schmitt trigger/inverter to provide a time delay after power-up. A switch is provided to allow the operator to manually reset the system as well.

The microprocessor is a 6809, selected for its architecture. It is efficiently able to run block-structured code such as that generated

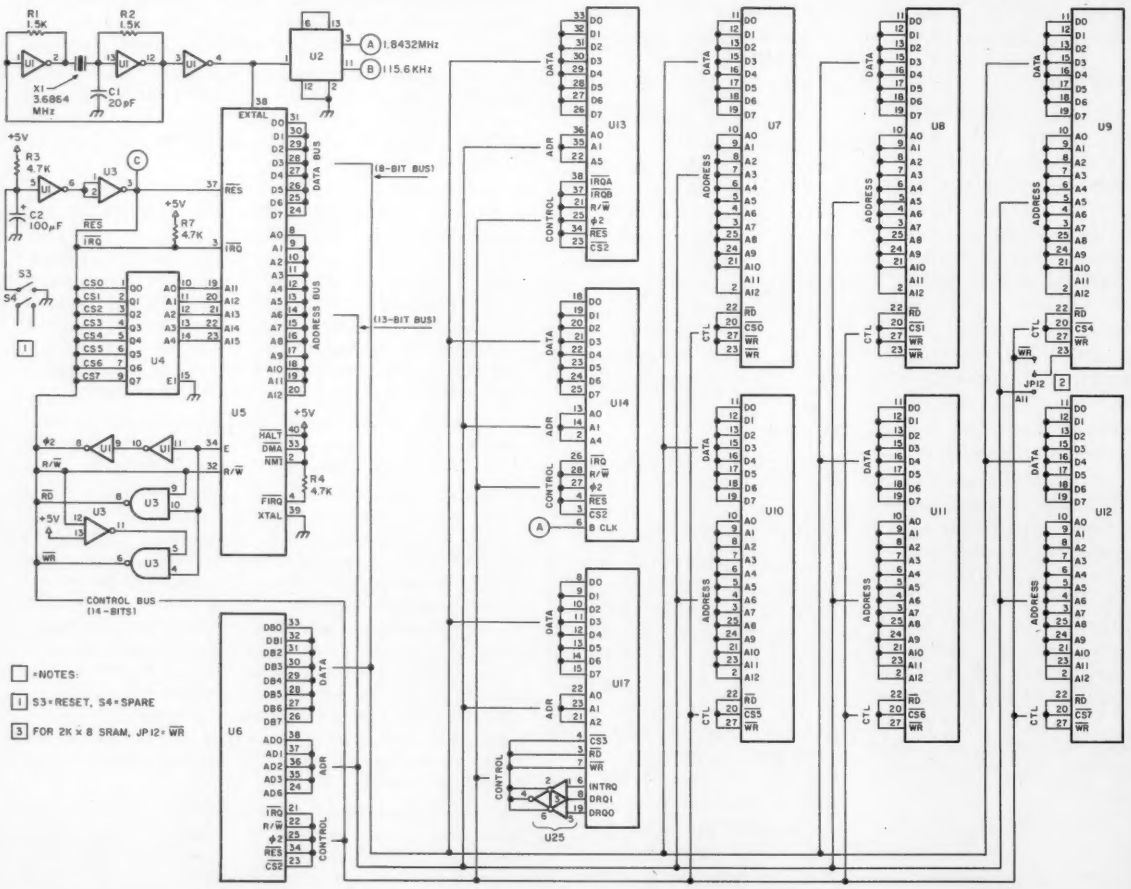

Fig. 1. System circuitry.

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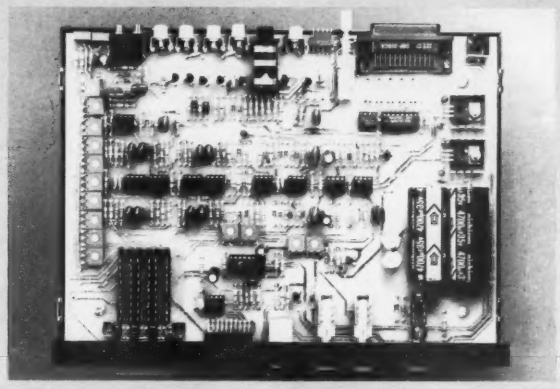

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by PASCAL and FORTH compilers. Some additional circuitry is provided on the control bus to provide compatibility with the memory and HDLC controller. This is implemented using TTL for clock buffering and generating separate !RD and !WR signals. (Note that a leading ! means negative true logic in this discussion.)

The memory bank consists of six JEDEC-standard "Byte-wide" sockets. Each 28-pin site can accommodate RAM, ROM, EPROM, or EEPROM. The beta configuration calls for the low-order sockets, U7–U9, each to contain a 2K-byte static RAM chip (such as the AMD 9128, Toshiba 2016 or TI 4016) for a total of 6K bytes. The other three sockets contain 2764 EPROMs at 8K bytes each for a total of 24K bytes. This is more memory than many of the current crop of low-end "home" computers!

For maximum flexibility and to allow using higher-density memories (such as 8K-byte static RAMs, and 16K- or 32K-byte EPROMs), the address map is burned into a 32 × 8 bipolar PROM. This address decoder allows for any memory mix with a resolution of 2K bytes. Thus, a full 64K-byte address space can be accommodated with no changes other than burning a new address decoder PROM (at a cost of about $1.00)—and buying more memory, of course!

In order to allow the operator to store his station call-sign only once (as opposed to storing it every time he turns the TNC on), as well as to allow flexibility in saving various serial port parameters (baud rate, stop bits, parity) and radio timing characteristics (key-up delay, hang time, etc.), a form of nonvolatile memory (NOVRAM) is incorporated into the TNC. 256 bits of this memory are provided. The interface is through a parallel I/O port (U6), simplifying the hardware design as well as protecting the NOVRAM from any glitches that might alter its contents in an unexpected manner.

This memory requires no batteries or other power to retain data for at least 10 years. It can be rewritten 10,000 times, or once a day for nearly 30 years! (Usually, it will be written to once or twice during initial setup, then only when the operator desires a "permanent" update, maybe once a month.)

The HDLC chip used is a Western Digital 1933B-00, selected for the fact that it contains a digital phase-locked loop (DPLL), used to recover clock information from the incoming NRZI data stream, and because it is the least expensive chip available which has this feature. Unfortunately, it wasn't designed just to hang on a 6809 bus, so a little TTL glue is needed to attach it.

Apart from the separate !RD and !WR lines, also needed for the memory system, the three interrupt outputs from the device are inverted and buffered by open-collector inverter sections of U25. Note that the data bus on this chip is in-

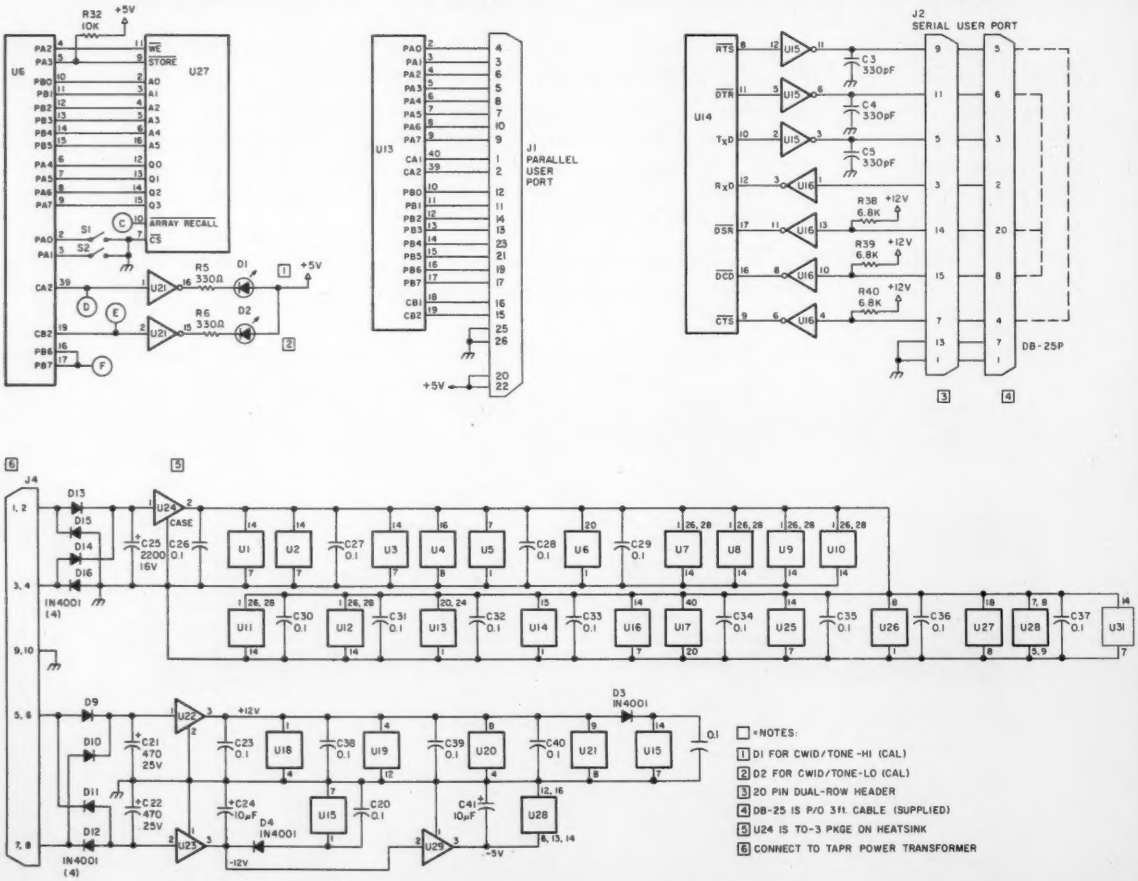

Fig. 2. I/O and power circuitry.

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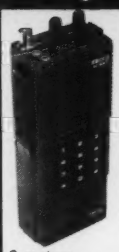

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verted, so all data read from the chip must be complemented by the microprocessor before it is used, and likewise all data written to the HDLC controller must be complemented prior to writing.

The reset signal for the HDLC chip is provided by U6, which also provides the 32× baud-rate clock from one of its 16-bit programmable timers. The other 16-bit timer contained within the 6522 is used for maintaining several software clocks. These control such things as the CW ID interval, CW-character dot times, and so forth.

Terminal I/O

The operator interface consists of both a serial RS-232C port and a TTL-level dual 8-bit parallel port.

The most commonly used interface is the serial port. It supports the RS-232C voltage, current, impedance, and pinout specification, and the port looks like data communications equipment (DCE). This simply means that a standard terminal will attach to the port and work! If you choose to use a personal computer, it must look like data terminal equipment (DTE)—a terminal emulator. If your computer looks like DCE, a null-MODEM cable may be used.

The serial port is driven by a type 6551 UART (universal asynchronous receiver-transmitter), which is a 6809-family I/O device. It contains an internal, software-controlled baud-rate generator and can operate at all standard baud rates from 50 to 19,200 baud. Further, it supports 5- to 8-bit data widths, odd/even/mark/space/no parity options, and 1, 1½, or 2 stop bits.

The TTL levels from the 6551 are buffered and inverted by a 1488 driver (output) and a 1489 buffer (input). The output lines are loaded with 330-pF capacitors to ensure that the maximum slew rate of the RS-232C spec is not exceeded, while the 1488 driver is isolated from the power supply by a pair of diodes (D3 and D4) to protect the TNC from faults that may occur on the RS-232 interface. The connector on the PC board is designed to interface with a standard IDC connector and cable, the other end of which may contain a DB-25 crimp-on connector. The DB-25 will then have the correct pinout to attach to a terminal (DTE).

The parallel port uses no standard pinout, as no real standard exists for a bidirectional port of this type. It is included for completeness. An optional accessory for this port that turns the TNC into an EPROM programmer (for software bootstrapping) is available from TAPR.

Radio I/O and Modem

The TNC provides an audio signal for the microphone input of the radio transmitter, a "contact clo-

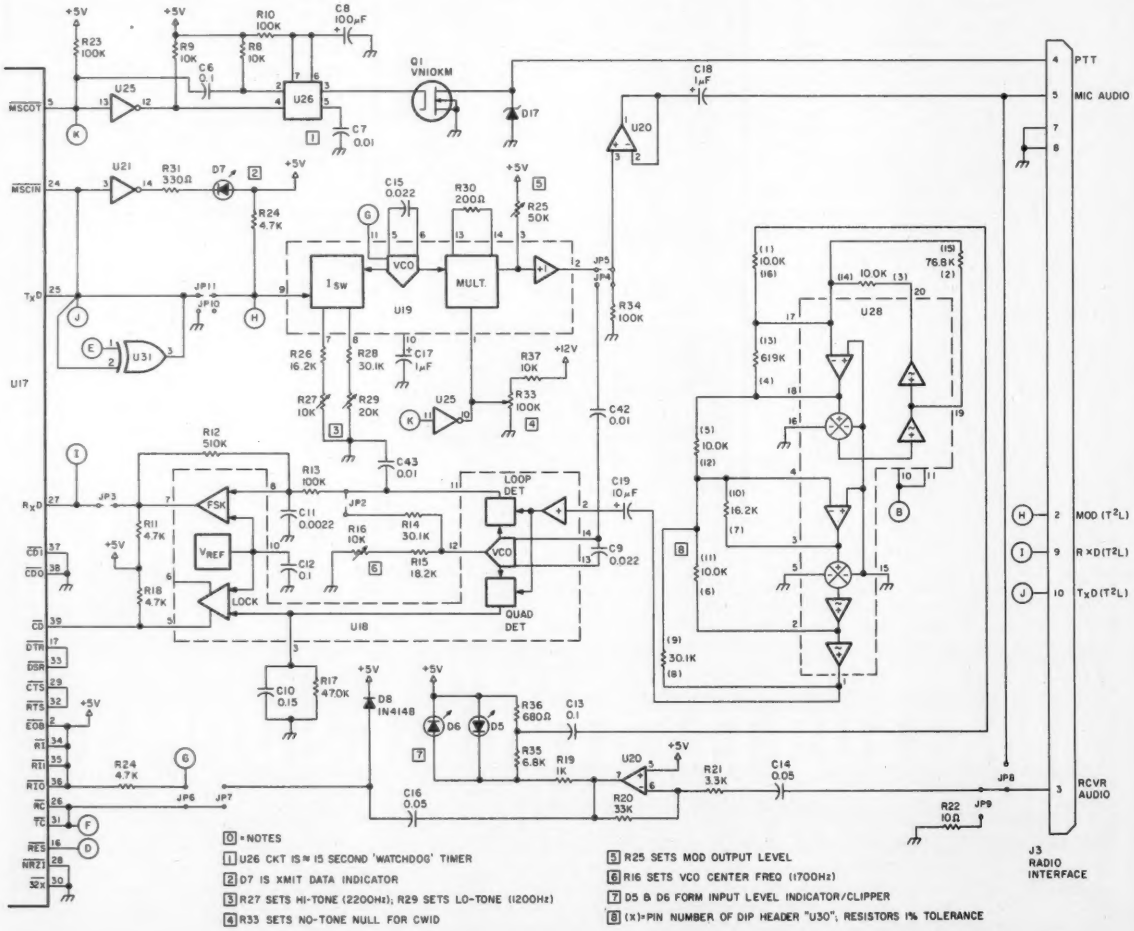

Fig. 3. Modem circuitry.

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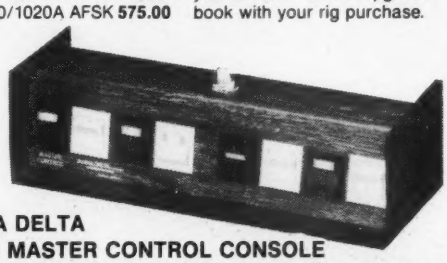

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Our Model MACC Master AC Control Console has just been given full UL approval! This is not an easy "award" to obtain—it took 10 months of testing, destructing, smoking, burning, crushing and in general not being nice to the little unit. It was approved both for its protection capability and as an AC power strip. It's the only desktop surge protected console to be granted full UL listing. For the record, it's UL category 449E, file #E60255.

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Hot on the heels of the launch of Oscar X, the entire Yaesu organization proudly introduces the FT-726R, the first full duplex (simultaneous transmit and receive) multimode, multiband VHF/UHF transreceiver ever achieved in the Amateur industry. A triband unit equipped for USB, LSB, CW, and FM, the FT-726R comes factory equipped for 2 meters. Optional units are coming soon to provide operation on the HF satellite downlink (10, 12, and 15 meters), 6 meters, 70cm Low (430-440 MHz), and 70cm High (440-450 MHz). A total of three modules may be installed at any given time, and there is no restriction on which of the above lines may be installed.

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DON'S CORNER: Fall is contesting season. What a great time to pick up a few new countries. No, you don't need the power of Niagara. Just patience, luck, and LISTEN! A good antenna is a better addition than an amp. It's true, that ancient phrase, "you can't work 'em if you can't hear 'em." One ham here was flipping around the dial and heard a CQ on SSB. After a 20 min. QSO, the other guy asked if our boy wanted a QSL. Not really was the reply. Seems he didn't collect cards. The DX contact had to plead with our ham to take one, so he said go ahead and send it along if he really wanted to. Two weeks later a SWAN ISLAND QSL arrived. KB5PE, our hero, called and asked me if that was anything special. You never know. . .

73, Don.

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sure" to provide PTT actuation, and accepts audio signals from the speaker/headphone jack for reception.

The PTT actuation is accomplished via a VFET transistor, protected by a zener diode. When the TNC commands a transmit condition, the !MISCOT pin of the HDLC controller goes towards ground, activating the 555 timer. The output of the 555 biases the VFET on, providing an "on" resistance on the order of a few Ohms. This impedance is low enough to key every radio tested to date. When the transmission is completed, the !MISCOT line goes high, turning off the 555 and hence the VFET. Any voltage spike generated by the radio is suppressed by the zener, thus protecting the VFET and the TNC.

In the event that a glitch of some sort occurs (brown-out?) during the absence of the station operator, the 555 timer acts to protect the channel independent of the microcomputer. The component values shown provide an approximately 14-second-duration maximum keydown time. This time may be increased and will need to be if the user plans to send long files at lower baud rates (such as might be required on HF frequencies).

The modulator is a phase-coherent FSK circuit using the popular XR2206 chip. This results in a low-distortion sine-wave output along with a simple, easily adjusted circuit. The output is buffered via an op-amp section before being passed to the radio I/O connector.

The output amplitude level is adjustable from a few millivolts to a few volts peak-to-peak and is typically set for 75 mV p-p. A null adjustment is provided and the tone keyed on and off for CW ID purposes. A square-wave output is also provided for connection to the 6522 PB6 input. This enables the software to configure a frequency counter for calibrating the modem to within a very few Hertz of the target frequencies.

The tone pair most commonly used is 1200 Hz and 2200 Hz for compatibility with amateurs using surplus Bell 202-style modems.

The receive side is somewhat more involved. The desired bandpass characteristic for using the Bell 202 tones is not met very well by unmodified amateur or commercial FM communications equipment. While a demodulator can be made to work by limiting and careful adjustment, it has been shown that the XR2211 PLL demodulator used in the TAPR TNC yields a performance improvement on the order of 3 dB when preceded by the switched capacitor filter shown in the schematic diagram.

The incoming signal is buffered by an op-amp section and then passed to a limiter/indicator using a pair of LEDs. The LEDs provide operator feedback for setting the volume of the receiver. The best adjustment is when the LEDs are just extinguished with an incoming signal.

A resistive divider then couples the signal to the MF10 switched capacitor filter. A second-order high-pass filter followed by a second-order low-pass filter then corrects the radio system bandpass characteristic. The filtered signal is then passed to the XR2211 PLL demodulator, where data carrier detection and data recovery are accomplished.

The MF10 filter has the advantage of not requiring any critical capacitors (nor any caps, apart from bypassing), relying instead on 1% resistors (cheap) and a crystal-controlled clock signal (already needed for the microprocessor). The result is an easily replicated filter characteristic with no adjustments!

The XR2211 circuit is very standard and reliable. The only changes made in the circuit recommended by the manufacturer are in the area of the data carrier detect filter capacitor. It was increased in size to help eliminate chatter and provide greater resistance to false indications due to noise.

Connections are provided to the demodulator to allow calibration by the same on-board frequency counter that is used to set up the XR2206 modulator. The result is an easily calibrated circuit that requires no special equipment.

If you desire, provision has been made for connecting an external modem for further experimentation and development.

FOR FURTHER INFORMATION

To find out more about packet radio, TNC boards, manuals, and parts kits, you may contact Tucson Amateur Packet Radio at PO Box 22888, Tucson AZ 85734.

There may be a TAPR beta site in your area. If so, talking on one of the local repeaters may lead you to someone with a packet station on the air. Numerous local groups are springing up, and many FM/repeater groups are beginning to incorporate packet operations into their systems.

Subscribing to *73* will provide you with other articles on packet radio, and other amateur magazines will also be carrying more and more information on this new mode.

Additionally, the following organizations have regular newsletters with packet information: TAPR, AMRAD, PO Drawer 6148, McLean VA 22106, and SLAPR, 1309 Gloucester Dr., Edwardsville IL 62025. Please include an SASE when writing to any of the above groups for information.

Packet promises to revolutionize amateur communications in the 80s much as did SSB in the 50s and FM in the 70s.

Power Supply

The TNC power supply uses full-wave rectifiers and series-pass regulators for stiff, low-impedance power sources. The design is very conventional and uses the 78/79XX series regulators for their excellent regulation, thermal overload protection, low cost, and wide availability. +12 V is supplied to the modem and RS-232 circuitry, while −12 V is used only for the RS-232 interface and −5 V is used only for the switched capacitor filter in the modem section. +5 V is handled by the more substantial LM309K, which may be mounted on or off board and supplies every subsystem on the TNC. Extensive bypassing is used (don't cheat and leave any out!), and no problems have been noted with cross-talk on the +5-volt bus.

Construction

With the foregoing as background, you are now ready to tackle the actual construction of the TNC. Please be warned, however, that the TAPR TNC is a complex piece of equipment, and construction by the faint-hearted or inexperienced is not advised.

While a wire-wrap job should yield a perfectly suitable unit, construction will be much easier if you elect to use a PC board. TAPR has blank boards available for a nominal price, and I suggest you write TAPR at the address given elsewhere in this article for details on price and availability. TAPR also has parts kits available, and you may want to take advantage of this service as well.

If you decide to obtain the parts yourself, consult the parts list for a detailed breakdown of the necessary items. It is OK to substitute many of the items (such as IC bypass capacitors) but be

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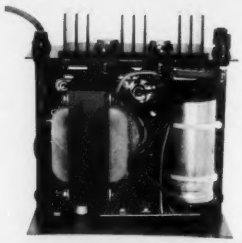

INSIDE VIEW – RS-12A

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PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105 - 125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE: Less than 5mv peak to peak (full load & low line)

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM-A Series

19" X 5¼ RACK MOUNT POWER SUPPLIES

Model	Continuous Duty (AMPS)	ICS* (AMPS)	Size (IN) HXWXD	Shipping Wt. (lbs.)
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50

MODEL RM-35A

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W X D	Shipping Wt (lbs)
RS-4A	3	4	3¾ x 6½ x 9	5
RS-7A	5	7	3¾ x 6½ x 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 x 7½ x 10¾	11
RS-12A	9	12	4½ x 8 x 9	13
RS-20A	16	20	5 x 9 x 10½	18
RS-35A	25	35	5 x 11 x 11	27
RS-50A	37	50	6 x 13¾ x 11	46

RS-M SERIES

MODEL RS-35M

- Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4½ x 8 x 9	13
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

VS-M SERIES

MODEL VS-20M

- Seperate Volt and Amp Meters
- Output Voltage adjustable from 2-15 volts
- Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES

MODEL RS-12S

- Built in speaker

MODEL	Continous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt (lbs)
RS-7S	5	7	4 x 7½ x 10¾	10
RS-10S	7.5	10	4 x 7½ x 10¾	12
RS-10L(For LTR)	7.5	10	4 × 9 × 13	13
RS-12S	9	12	4½ x 8 x 9	13
RS-20S	16	20	5 x 9 x 10½	18

Parts List

Part	Part Number	Description
Integrated Circuits—TTL		
U3	74LS00	Quad 2-input NAND gate, DIP, plastic
U25	7406	Hex Inv., OC, DIP, plastic
U1	74LS14	Hex Schmitt trigger, DIP, plastic
U2	74LS393	Dual 4-bit counter, DIP, plastic
U4	82S123	32 by 8 PROM, programmed, plastic
U31	74LS86	Quad 2-input exclusive OR gate, DIP, plastic
—NMOS		
U17	WD1933B-XX	HDLC controller, plastic
U7, 8, 9	2016/4016	2K by 8 static RAM, 450-nSec, plastic
U27	XD2210	64 by 4 NOVRAM (Xicor)
U10, 11, 12	2764	8K by 8 EPROM, 450-nSec
U13	6520/6821	PIA, 1 MHz, plastic
U6	6522	VIA, 1 MHz (Synertek/ Rockwell/Commodore)
U14	6551	ACIA, 1 MHz, plastic (Synertek/Rockwell)
U5	MC6809P	8-bit uP w/clock, plastic
—LINEAR		
U28	MF10CN	Dual filter (National Semi), plastic
U24	LM309K	TO-3, + 5-volt regulator
U26	NE555V	Timer, 8-pin mini-DIP, plastic
U15	MC1488P	RS-232 driver, plastic
U16	MC1489AP	RS-232 receiver, plastic
U21	XR2203/ULN2003	7 Darlington driver, plastic
U19	XR2206CP	FSK Mod, plastic
U18	XR2211CP	FSK Demod, plastic
U20	CA3240E	Dual hi-impedance op amp, 8-pin mini-DIP
U22	MC7812CT	TO-220, + 12-volt regulator
U33	MC7912CT	TO-220, – 12-volt regulator
U29	MC79L05	TO-92, – 5-volt regulator

Resistors

5%, 1/4-Watt carbon film or composition	
R22	10 Ohm
R30	200 Ohm
R5, 6, 31	330 Ohm
R36	680 Ohm
R19	1.0k Ohm
R1, R2	1.5k Ohm
R21	3.3k Ohm
R3, 4, 7, 11, 18, 24	4.7k Ohm
R35	6.8k Ohm
R8, 9, 32, 37	10k Ohm
R20	33k Ohm
R10, 13, 34, 23	100k Ohm
R17	470k Ohm
R12	510k Ohm
R38, 39, 40	6.8k Ohm
1%, 1/8-Watt precision (must be stable)	
U30	10.0k Ohm
R26, U30	16.2k Ohm
R15	18.2k Ohm
R14, R28, U30	30.1k Ohm
U30	61.9k Ohm
U30	76.8k Ohm

Trimpots

R16, R27	3299W-10k	10k Ohm	(Bourns P/N)
R29	3299W-20k	20k Ohm	(Bourns P/N)
R25	3299W-50k	50k Ohm	(Bourns P/N)
R33	3299W-100k	100k Ohm	(Bourns P/N)

Capacitors

Disc ceramic, 16 volt or greater, 0.25" center-to-center lead spacing	
C1	20 pF
C3–5	330 pF
C26–40, C20, 6, 12, 13, 23	0.1 μF
C11	0.0022 μF
C9, 15	0.022 μF or 0.027 μF COG
C7	0.01 μF
C14, 16	0.047 μF or 0.05 μF
C10	0.15 μF

Electrolytic, radial-lead (higher voltages may be substituted)		
C17, C18	1.0 μF/16 volt	(0.1" lead spacing)
C19, 24, 41	10 μF/16 volt	(0.1" lead spacing)
C2, 8	100 μF/16 volt	(0.15" lead spacing)
C21, C22	470 μF/25 volt	(0.2" lead spacing)
C25	2200 μF/16 volt	(0.3" lead spacing)

Miscellaneous

Diodes

D1, 2, 5, 6, 7	SR503D	Red LED (NEC)
D3, 4, 9–16	1N4001	Silicon diode, 100 PIV
D8	1N4148	Silicon diode, switching
D17		33-volt zener diode, 10%, 400 mW or 1 Watt

Sockets, DIP, side-wipe contacts, for .062" PC board	
	8 pin
	14 pin
	16 pin
	18 pin
	20 pin
	28 pin
	40 pin

IDC connector, dual-row, 0.100" centers, nonpolarized, w/strain-relief	
J3, J4	10-pin connector
J2	20-pin connector
J1	26-pin connector

Other

U30		16-pin DIP header
S1–S4	CTS204	4-pole DIP switch
X1	NDK	3.6864-MHz crystal
	15-38-1024	Shunt (molex®)
	22-03-2021	02-square pin strip (molex)
	22-03-2031	03-square pin strip (molex)
	22-03-2041	04-square pin strip (molex)
J3, 4	22-03-2051	05-square pin strip (molex)
J2	22-03-2101	10-square pin strip (molex)
J1	22-03-2131	13-square pin strip (molex)
Q1	VN10KM	V MOSFET

certain to use temperature-stable components in the modem area and for the switched capacitor filter. Saving a few nickels here can lead to grief later on!

The software is available on a set of EPROMs. Source listings may be available, but they are bulky. Furthermore, unless you have a native-code PASCAL compiler for the 6809, the source code probably won't do you much good.

The TNC manual, available from TAPR, contains many details on operation, command structure, etc., that are simply too lengthy to print here, so obtaining this item is an absolute must.

Once you have all the parts, sort them out and organize them so you won't be fishing around for a particular resistor at midnight... anything you do to relieve tensions and frustrations as the building phase progresses usually pays off in reduced troubleshooting time after power-up.

The first construction step is to inspect carefully the PC board for shorts or opens. Use a magnifying glass, especially around the address decoder, the data/address lines on the top of the board in the memory array, and at the RS-232 buffer area. It is always possible that a board could get out that has an undetected flaw, and these are the high-density areas that are most likely to be troublesome.

The next step is to mount the IC sockets. Just tack-solder them in at the four corners, one at a time. (Use ONLY a low-wattage, temperature-controlled soldering iron with 60/40 or 63/37 rosin-cored solder.) When the socket is properly seated on the board, solder all remaining pins before going on to the next socket. You are less likely to miss a pin if you do it in this manner. Take your time, as it is much easier to be extra careful now than track down the cold or unsoldered pin later.

Next come the resistors. Be sure to double-check all values before soldering any of them in place. Follow these with the capacitors, paying special attention to polarity on the electrolytics.

Then solder in place the diodes, rectifiers, and voltage regulators. Don't mix up the 7812 and 7912 regulators—they can look the same at 2:00 am!

Finally, the crystal and connectors get installed. Be especially careful that you don't cause any solder bridges across the connector pins, as this can be disastrous!

Inspect the board for cold or otherwise poorly made connections. Be sure no lead clippings have lodged under the IC sockets and that no bridges occur between connections or foils.

If the board passes the visual inspection, set it aside. Wire up your power-supply transformer and radio interface cable, using connectors to match your radio. (You probably will find the appropriate connection information in the Radio Interface Appendix in the TNC manual; otherwise you will have to figure it out.) Incidentally, if your radio isn't mentioned in the interface section, please send a note to TAPR with the pertinent information (after you get it on the air and verify it, please!) for inclusion in future manual releases.

Now wire up your terminal/computer interface. If you are using an RS-232 terminal, you will find that an insulation displacement connector (IDC) at the TNC and terminal ends will work just fine, matching pin 1 of the TNC to pin 1 of the terminal connector.

Firing It Up

The first step in testing the unit is to power it up with no ICs in their sockets (you didn't use sockets...?). Connect the transformer to the TNC and apply power. Using a voltmeter, verify that +12, +5, Gnd, −5, and −12 volts are all where they belong and within tolerance. *Be sure they are right* before proceeding with the next step.

Remove power from the TNC. Now ground yourself, the TNC, and the ICs. *Carefully* install the ICs in the sockets. If you mess up, use proper tools to remove the chip, and try again. Don't use a tool for removing the HDLC controller that doesn't allow for the hump in the middle of this chip or you will wind up with a pair of half-HDLC chips, neither of which will work...

A final inspection is in order now. It is advisable to have someone else inspect your work. Often someone not close to the project can spot something that you may consistently have overlooked. If all appears OK, you are ready for the smoke test!

Place DIP switch 1 in the closed position. Set your terminal at 300 baud, no parity, 8 data bits (same as 7 bits and space parity). Connect the terminal to the TNC and hit the return key (some terminals "stick" and the return key loosens them up). Apply power to the TNC. You should see the signon message appear. If you don't, or if you smell something like a burning TNC, remove power in a hurry!

Assuming all is working properly, you may now go through the calibration procedures as outlined in the TNC manual. If all is not well, consult the trouble-shooting hints section of the manual for help.

You are now ready to join the ever-increasing ranks of amateur operators pioneering this new mode. Good luck! ■

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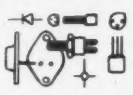

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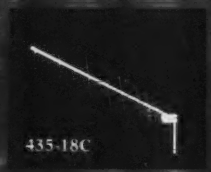
BANDWIDTH: .. 144–150 MHz	BOOM LENGTH: ..... 12'9"
GAIN: ..... 11 dBdc	VSWR: 1.2:1
BEAMWIDTH: ..... 48°	WINDLOAD: ..... 1.25 sq. ft.
FEED IMP: ..... 50 ohm unbal.	WT. (LBS): 7.5
BALUN: 4:1,2KW	ELLIPTICITY: ..... ± 3 dB Max.
CIRCULARITY SWITCHER:	INCLUDED

The 435-18C is a star performer, an optional CS-2 circularity switcher puts left, and right-hand circular control in your shack, and doubles as a two port divider/impedance transformer for single feed line convenience.



435-18C

Specifications: (435-18C)

BANDWIDTH: .. 420–450 MHz	GAIN: ..... 12 dBdc
BOOM LENGTH: ..... 7.3 ft.	VSWR: 1.5:1
BEAMWIDTH: ..... 44°	FEED IMP: ..... 50 ohm unbal.
WT. (LBS): 4.5	BALUN: 2–4:1, 1KW
MAST DIA: ..... Cen–Rear/1½"	ELLIPTICITY: ..... 3dB MAX.
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416-TB 65.00
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CN-620B 1.8-150 MHz SWR/Pwr Mtr 110.00
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Where does an audio transistor become a good rf amp? On 1700 meters, of course.

Seventeen hundred meters! This is the band of frequencies that gives you a chance to experience the world of long wavelengths. It can't fail to touch the imagination of the experimenter. Little attention has been paid to this FCC Part 15 band between 160 and 190 kHz even though it has existed for many years. Granted, there are strong limitations on antenna size and transmitter power as well as the fact that this isn't a true ham band. But it represents an opportunity for a first-hand view of the realm of low-frequency communications. With true ham resourcefulness and imagination some surprising things happen here.

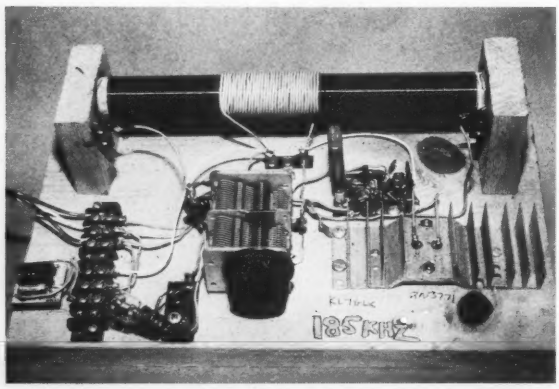

Photo A. The completed transmitter.

The Rules

For those unfamiliar with Part 15, it deals with unlicensed radio transmitters that are permitted to operate under certain conditions. You may recall that toy CB walkie-talkies are legal . . . somehow. That somehow is Part 15. These regulations include a host of other services, such as industrial, scientific, and medical applications of radio. 1700 meters is specifically spelled out as an experimental band here and is free from some of the more restrictive rules concerning Part 15 in general. Anyone is permitted to operate an unlicensed 1-Watt transmitter using any mode for any purpose as long as the antenna is less than fifty feet in length. (Alternately, the power limitation can be calculated as not exceeding 15 microvolts per meter measured at 300 meters.)

So What Can I Expect?

Believe it or not, a CW or sideband signal into a good antenna can be heard for a hundred miles or more, even with these restrictions. While there are reports of ranges in excess of five hundred miles, the average station should be easily heard twenty to forty miles away. Today there is a small but growing number of amateurs—true radio pioneers—actually using this band for communications. Unfortunately, little information about it has been available to the average ham.

This article will be limited to the transmitting aspect of 1700 meters except to say that any number of commercial receivers available today will work well on this band when used with a good

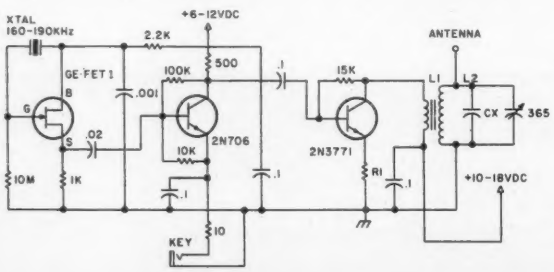

Fig. 1. 160-190-kHz CW transmitter.

antenna. An antenna that performs well for transmitting will work well for receiving. However, don't be deceived into thinking that just any long wire will work at these frequencies. It is likely you'll spend more time tuning up a 1700-meter antenna than anything you've ever assembled at higher frequencies. There will be more on antennas later.

The Transmitter

Building a transmitter at these low frequencies will come as quite a shock, especially if you've spent much time building UHF or microwave circuits. The tuning coils are monstrously large, lead lengths can be measured in feet, and audio transistors work great as rf power amplifiers.

This transmitter, as shown in Photo A, was a real breadboard design; it was built on an 8- × 14-inch piece of pine. This was done because of the inductive effects on the tank coil that would be caused by a metal enclosure. While this type of construction is not necessary, I recommend it for your first transmitter since it makes tuning up much easier.

The CW transmitter shown in Fig. 1 uses a GE FET-1 as a crystal oscillator feeding a 2N706 power amplifier. A 2N3771 is used as a final amplifier, although any NPN power transistor like the HEP247 or the SK3036 should work fine. Notice the lack of any tuned circuits until the final amplifier. When dealing with large coils, I've tried to keep their number to a minimum. The final tank coil, L2, is 440 turns of #26 enamel wire wound on a ¾-inch-outer-diameter piece of PVC plastic water pipe. The coupling link, L1, is 32 turns of single-conductor insulated hookup wire wound about the center of L2. An AM broadcast radio variable capacitor of 365 pF is paralleled with a 350-pF capacitor, Cx. This may have to be varied with individual transmitters, but this value is a good starting place for tuning 160-190 kHz. R1 in the emitter lead of the final amplifier is varied to produce the 1-Watt input required by Part 15. With 18 volts on the collector, I've found 15 Ohms is about right, but here again individual adjustments may be necessary.

There are several places to key the transmitter. The easiest is to simply key the emitter of the 2N706. If the transmitter is located a long distance from the operating site, a keying circuit like the one shown in Fig. 2 will control the transmitter by keying in 10 V dc. The current requirement is practically nil, so a long run of wire is possible.

Photo A shows the final transistor with a large heat sink. At one Watt, the final stays cold without the heat sink, but I've used this transmitter for experiments under Part 15 at higher inputs; that is why it is shown. A small IC ID generator can be seen attached to the terminal strip for use as a beacon.

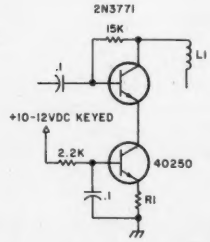

Fig. 2. Alternate circuit for transmitter keying from a remote location.

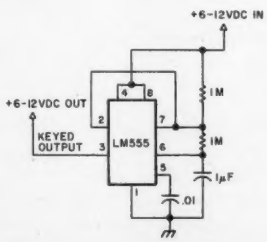

Fig. 3. LM555 timer used as a beacon keyer.

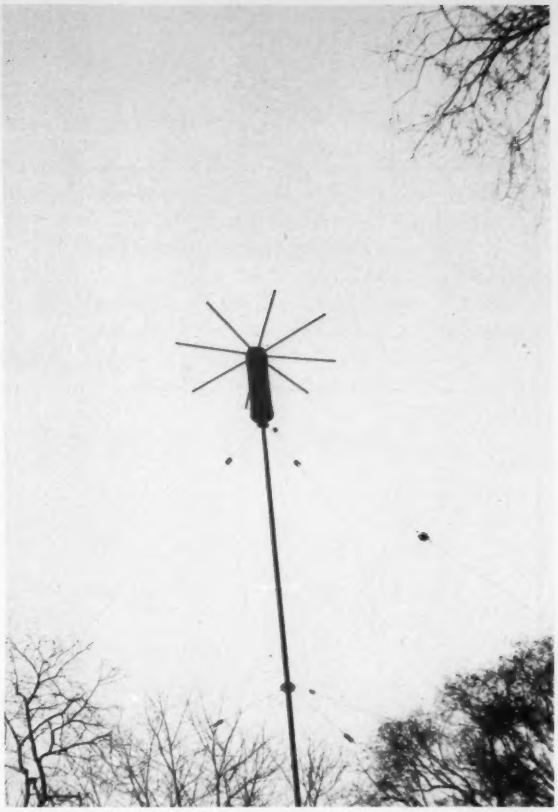

Photo B. The top-hat vertical for 160-190 kHz.

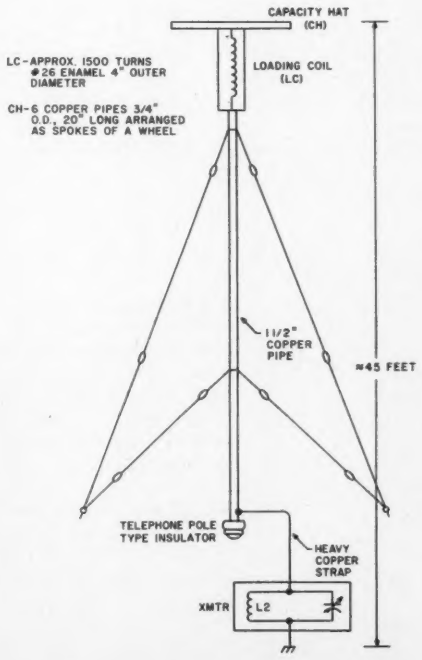
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Fig. 4. One type of antenna used by the author.

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A simple LM555 timer (shown in Fig. 3) will key either the 2N706 driver directly or the circuit in Fig. 2, in a recognizable on/off pattern. This will allow you to distinguish your signal from others on the band, while doing remote measurements for antenna adjustments and so on.

Tune-up is simple. First listen on a receiver to make sure the oscillator is oscillating. Then tune C1 to resonance. A good indication is a glowing neon bulb placed across L2. With the high turn ratio between L1 and L2, the transmitter becomes a miniature Tesla coil capable of several hundred rf volts. Be careful that the tank circuit is dipped for 160-190 kHz and not harmonic. Using the values given for L1 and C1/Cx, this should be unlikely.

An Antenna

Antennas for 160-190 kHz are an entirely different subject. Since you are limited to fifty feet in length, each antenna will be an individual unlike any other. It will be necessary to experiment to get the best combination of values to achieve maximum radiation. These values will depend on local conditions such as soil conductivity, proximity to metallic structures; the list is endless. Here are a few guidelines to follow. Stay strictly with vertical polarization since losses from horizontal antennas are severe given the limitations of fifty feet. Use a high-quality base insulator because you'll be dealing with high rf voltages even at 1 Watt. Also use the best grounding system you can construct. Lastly, listen with a receiver at a considerable distance from the antenna and adjust the combinations of loading coils, grounds, etc., to produce the best S-meter readings. Be prepared to do a lot of experimenting (and learning), but eventually your efforts will be rewarded as you're able to add more and more miles to your communications range.

Fig. 4 is an antenna I've used and one which others can be patterned after. L2 of the transmitter is grounded on one side and the other is fed by a heavy copper strap to the base of a large diameter copper pipe. At the top of this guyed mast is a capacity hat and a loading coil. The coil is made of #26 enamel wire close-wound on a 4-inch-diameter piece of PVC pipe. The number of turns is somewhere in the neighborhood of 1500, and as I said, there are some monstrously big coils at these frequencies.

The transmitter is located directly over an old 60-foot-deep well with a 4-inch iron casing. This and numerous radials make up the ground system. This transmitter and antenna radiate a signal that can be consistently heard over twenty-five miles, which isn't bad when you consider the limitations of using a very short antenna with wavelengths approaching a mile.

During the last WARC, 160-190 kHz was proposed as a ham band. Perhaps if interest grows it will find its way among our frequencies. Right now it is still a great place to explore. ■

Parts List

Crystal

160–190 kHz	$12.50	from Jan Crystals, 2400 Crystal Drive, PO Box 06017, Ft. Myers FL 33906. (Suggested frequency range of 180–190 kHz since this is where most serious operation is done.)

Transistors

1 GE FET-1	$2.00	SK3112 also suitable.
1 2N3771	$4.50	SK3036, HEP247, or other power NPN transistors are suitable.
1 2N706	$1.00	2N2369A, SK3122 are suitable.
optional		
1 40250	$4.00	SK3026 also suitable. Used for optional remote control of transmitter.

Resistors

All resistors are ¼ Watt, 10%. Cost: approximately 20¢ each.

1 10 Ohm
1 500 Ohm
1 1k
2 2.2k (only one required if optional remote control is omitted)
1 10k
1 15k
1 100k
1 10 megohm

Capacitors

1 .001 Ceramic	Capacitors from grab-bag-type assortments available from Radio Shack.
1 .02 Ceramic	
4 .1 Ceramic	$2.00

Random combination of silver micas to total 350 pF. Micas available from the same above sources, if purchased separately at 25¢ each.

1 350 pF variable	$1.00 from a local hamfest. Also, old BC AM radios.

Miscellaneous

1 2-watt resistor for emitter of power amplifier transmitter, to be experimentally calculated, to limit input to 1 Watt. (A safe bet is 25 Ohms for a 15-volt supply.) 25¢

1 2-foot section of PVC pipe for coil form. See text. A scrap item.

1 10- × 14-inch piece of ¾-inch pine breadboard, another scrap item.

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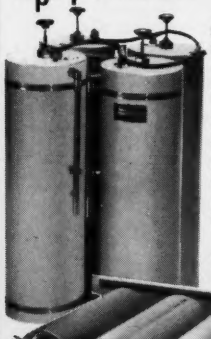

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TEXT BUFFER: Allows you to type ahead while receiving. Text entered into the buffer is visible above the split-screen line for correction before sending.

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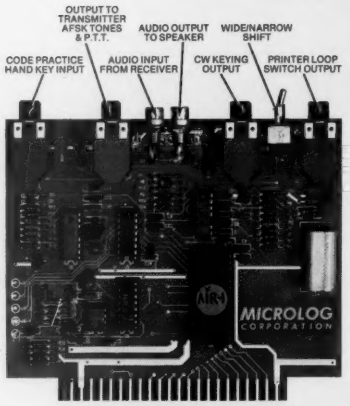

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Because the club shared the old Possum Hollow schoolhouse with the local Grange, the furniture was arranged as if for a fraternal lodge meeting. The wisdom of the founding fathers had preserved the one-room school intact, up to and including the large, ornate potbelly stove in the corner.

Since this was an agricultural community, the summer meetings were dispensed with and the fall harvest signaled the resumption of the monthly get-togethers. By this time of year, a small fire in the stove was much appreciated by everyone.

Thurman, the club treasurer, had made sure that his desk was near the stove. Since he was the technical expert of the club, his desk was the favorite gathering place.

The last bang of the president's gavel signaled the end of the business meeting and the time to break into little groups, like women at an old-fashioned quilting party. The technically-minded quickly grabbed folding chairs and slid in close to Thurman's desk. This part of the meeting was the lifeblood of the club and the part of the meeting that attracted the majority.

This particular meeting was held on a nippy fall evening and the fire felt good. The snapping, crackling sounds added to the festivity and good fellowship. Before the last sound of the president's gavel had died away, the usual gang was crowded around Thurman's large wooden desk.

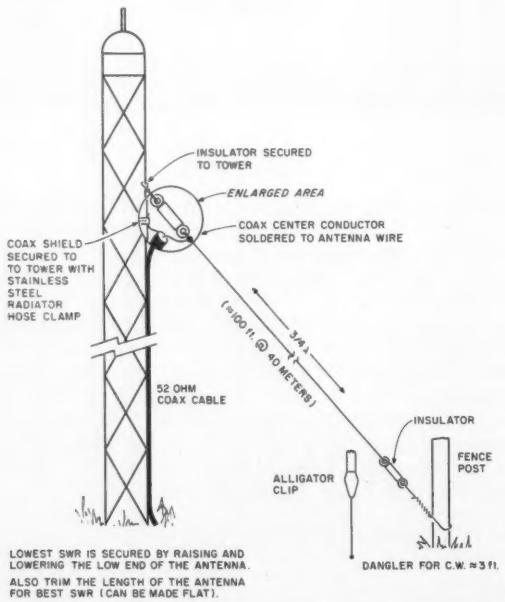
"Thurman, got any good ideas for a 40-meter DX antenna that I could string up before bad weather? Something not too expensive or elaborate."

Thurman looked up from the records he was working on and grinned.

"Not looking for much, are you, Ernest T.?"

"Well. . . guess that is a big order, but I figured if anyone could help me, it'd be you, Thurman."

Thurman closed the record book he had been working on, smiled, and placed his pencil behind his ear. Leaning back in his swivel chair, he turned slightly.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DANGLER FOR C.W. ≈ 3 ft.

Fig. 1. The 3/4-wavelength Extended Sloper Antenna. The length of the dangler will be the difference in length of the measurements calculated for the phone band and those for the CW band.

"Ernest T., you're in luck. I just finished a new antenna this summer and from the reports I've been getting from Europe, I'd say it's going to be a honey."

"What do you call it, Thurman?"

"Oh . . . I call it an Extended Sloper."

"What the heck is an Extended Sloper?"

Thurman's eyes twinkled as he tapped his pipe in the ashtray on his desk. He knew that he had Ernest T. on the hook. Thurman loved to spin a yarn, and this new twist on an old antenna would give him plenty of mileage. He lit his pipe and continued.

"Remember that quarter-wave sloper I had on my tower a while back?"

"Sure do," replied Ernest T.

"Well, I reasoned that if I lengthened it to 3/4 wave and aimed it toward Europe, it should have a little more gain and some added directivity." Thurman tilted his head back and blew a thick, undulating smoke ring—and waited.

"Well . . . did it work?"

"Sure did—and it loads up fine. Takes a little playing with for the exact length and height at the low end, but it's worth it and I'm getting excellent reports." With this statement several chairs slid in closer.

"How about a diagram, Thurman?" chimed in several voices in unison.

"OK, fellows, no problem. Its design is exactly the same as any other sloper with the exception of its length. Calculate the length for a quarter wave and then multiply by three."

"That's all there is to it?" asked Ernest T.

"That's all."

Otis had been leaning back in his chair with first one foot and then the other propped against the ornate trim on the potbelly stove. He now leaned forward and looked intently at Thurman. A look of disbelief was written across his face.

"You mean to tell us that you can load that odd length of wire?"

"I certainly can . . . and by adjusting the height at the low end and trimming the length, I can get the swr perfect. The best thing about the antenna is that I cut a 'dangler' piece of wire with an alligator clip attached, and I'm able to operate both phone and CW with perfect swr on both."

"What band you got it on, Thurman?" asked Forrest.

Thurman glanced around at all the inquiring faces and smiled. He withdrew his pipe from his mouth and slowly answered as if he was thinking of something.

"Well sir, it's on 40 meters. Look here, fellows—I'll draw you a diagram. It's very simple." He drew them a diagram and everyone scooted closer to watch. After he had finished putting in the figures, each observer made a rough sketch for himself.

"See, I told you it was easy. Just like a quarter wave, but extended. That's why I called it an Extended Sloper."

"Come and get it . . . Come and get it!" called Ramsey, the club refreshment coordinator. He was motioning for everyone to come to the table where the coffee pot and doughnuts were waiting. Tonight, fresh cider was on the table, and the thought of cider and doughnuts relegated the copies of Thurman's antenna diagram to shirt pockets.

Thurman chuckled to himself as he tidied up his desk and walked to the refreshment table. "Bet I'll be pruning some antennas next week," he thought to himself. ■

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Your Enemy, Feedline Loss

Let your swr meter stop this demon before it creeps up on you.

Martin K. Salabes K3CSV
1400 MacIntosh Boulevard
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If the performance of your antenna system seems to be deteriorating, the problem, or at least part of the problem, may lie in the coax connecting the transmitter with the antenna. Coax is subject to deterioration, especially if moisture can enter through the connectors or if there is a rupture in the vinyl sheath. Fortunately, there is a simple and fairly accurate way of measuring coax loss, using only an ordinary swr bridge.

When the frequency of a signal fed to an antenna is much lower than the resonant frequency of the antenna, the swr *at the antenna* will be infinity, or approaching infinity. In other words, all of the energy fed to the antenna will be reflected back. However, if the swr is measured at the transmitter end of the coax, the swr will be somewhat lower than infinity because not all of the forward energy reaches the antenna due to the loss in the coax, and not all of the reflected energy returns to the swr bridge for the same reason.

Most swr bridges actually indicate rectified rf voltage, although they are calibrated in swr. These voltages are relative, of course, and can be read on a linear scale. (If your swr bridge does not have a linear scale of some kind, one can easily be improvised.) So, all that is necessary to determine coax loss in dB is to read the forward and reflected relative voltages on an swr-bridge linear scale (while using a signal frequency much lower than the resonant frequency of the antenna) and plug these voltages into the standard equation for dB in terms of voltage: $dB = 20 \log_{10} V_1/V_2$, where V_1 = forward voltage and V_2 = reflected voltage.

As a voltage ratio is required for this equation, only relative voltages are needed, not actual voltages. Of course, the loss obtained this way is "round-trip" loss and is twice the loss experienced in normal use. One caution: As the transmitter is working into a very high swr, use as little output as possible and for as short a time as possible.

For example, suppose we feed a small 40-meter signal into a 10/15/20-meter beam. Adjust the swr bridge to read full scale forward (10 on the linear scale). Switching now to reflected, it reads 8 on the linear scale. Round-trip loss is therefore: $dB = 20 \log_{10} 10/8 = 20 \log_{10} 1.25 = 20 \times .097 = 1.94$ dB = a coax loss of .97 dB one way. Whether this is high or not will depend, of course, on how long the coax is. Check with the manufacturer's specifications for that particular type of coax.

If you are fortunate enough to possess or have access to a bidirectional wattmeter, the measurement is even simpler. As before, feed a signal into the antenna that is much lower in frequency than the resonant frequency of the antenna and measure forward and reflected power. Now just plug these values into the equation for dB in terms of power: $dB = 10 \log_{10} P_1/P_2$, where P_1 = forward power and P_2 = reflected power. As before, the loss obtained will be round-trip loss; one-way loss will be half as much.

One symptom of coax loss is an improving swr of your antenna system. As the coax deteriorates, less forward energy reaches the antenna and less reflected energy returns to the swr bridge, giving a false indication of an improved swr. If this is happening but your rig's performance is not what it used to be, check the coax loss. If it is much higher than the manufacturer's spec says it should be, just replacing the coax might make a world of difference. ■

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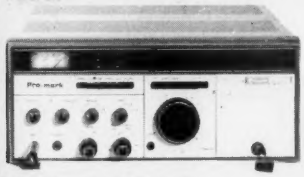

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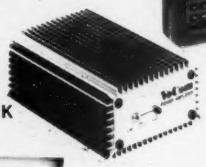

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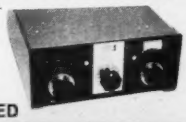

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R. Oudshoorn WA2NUB
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PVC Meets VHF

Flush high cost down the drain and build these cheap antennas. The gain is free.

Occasionally an antenna is wanted which is compact, cheap, and easy to make. Being inventive and a bit short of cash, I came upon this solution to fill the requirement for a couple of antennas I needed.

The following material was purchased at the local hardware store for the sum total of four bucks including tax; certainly, if purchased in a specialty store, you might save another buck:

- 5 feet of PVC water pipe, 1/2-inch i.d.
- 3 feet of copper tubing, 1/4-inch i.d., type L
- 2 PVC caps to fit PVC pipe

RG-58 coax, approximately six feet of it, was salvaged from the junk box. BNC or PL-259 type connectors, as required, also came from the junk box. These materials are enough to make a 2-meter and a 3/4-meter antenna.

Construction of the 3/4-meter antenna is as follows. Cut a length of approximately 20 to 24 inches of RG-58 coax. Strip the outer insulation for about eight inches. Remove most of the shield, leaving a section about 3/4 to 1 inch long. Do not remove the insulation from the center conductor. It will provide for support of the radiator.

Cut a piece of copper tubing about 7½ inches long; using either a tubing cutter or hacksaw, deburr ends. Using steel wool, clean one end of the tubing. Neatly tin the cleaned end.

Carefully slide the tubing over the coax and fan the piece of shield over the tubing. Measure where the tubing ends and wrap a few layers of tape around the coax to protect it from the sharp edge of the tubing. Slide the tubing back over the coax. Fan the shield back over the tubing as evenly as possible and carefully solder the shield to the copper tube. Use a large iron or a soldering gun, working quickly to prevent the center insulation from melting. If you find it difficult to solder the fanned shield, it can be tied down with a very thin strand of copper wire. That worked really well for me.

When the tubing has cooled, check with an ohmmeter for short circuits between the center conductor and the copper tubing. If all is OK, proceed to the next step.

Cut off 18 inches of the PVC pipe and slide the antenna into the pipe.

Mount a connector at the free end—either a BNC or PL-259; check again for short circuits.

Check swr with the antenna assembled; the PVC pipe will affect the swr somewhat. Prune as required. Trim the radiator only—don't try to shorten the copper tube.

When the swr is acceptable (less than 1.5 to 1), final-assemble the antenna inside the PVC tubing (a few turns of tape at the lower portion of the tubing will help hold it in place). Glue one of the caps on the top of the pipe and a grommet at the bottom end to keep the feedline centered.

The 2-meter antenna is made exactly the same way except for the dimensions. The copper tubing is cut to 18.5 inches. A 4-foot or longer piece of coax is stripped 19 inches. And the PVC pipe is cut to 41 inches.

Build and test the same way as the 3/4-meter antenna. To provide better support inside the tubing, wrap three bands of tape around the tubing to provide a tight fit inside the PVC pipe. I supported the center conductor inside one VHF antenna with a handy 1/2-inch-o.d. faucet washer; this kept the antenna nice and quiet, too.

These antennas are, obviously, 1/2-wave centerfed dipoles; they were very popular some years ago. They have fallen out of favor to the newer high-gain (3-dB), base-loaded, $40.00 antennas that are now flooding the market. These coaxial antennas perform somewhere between 1/4-wave and 3-dB-gain antennas in terms of gain; not bad for 2 bucks each!

The final tuning procedure should be done in a clear area with as little metal around as possible. Prune the antenna 1/8" or less at a time, especially the 3/4-me-

ter version. However, if you over-trim, it's easy enough to solder a piece of wire back on the radiator to lengthen it. When completed, the antenna can be sealed at both ends with RTV compound for total weather protection.

Use the best quality coax possible and it will not present any problems either during soldering or at any other stage of the construction. It also will last longer if the antenna is mounted on a tower and is exposed to all kinds of weather.

The antenna can be mounted in a variety of ways using easily-available clamps and brackets. Since these antennas are very unobtrusive, they also can be mounted either inside the ham shack or out of sight in a kitchen corner.

For those who have more ready cash and room, a somewhat better antenna could be made using RG-8/U coax and correspondingly larger diameter (1/2"-i.d.) copper tubing and (1"-i.d.) PVC piping. The other dimensions should stay the same.

This same principle also works well for a marine band VHF antenna, either as the main antenna or an emergency antenna. It can be tied to almost any unobstructed non-metallic (sailors take note) part of a boat—or even hand-held if necessary. The dimensions for this antenna should be: 40 inches of PVC pipe, 18 inches of copper tubing, and 48 inches of coax.

Construction and tuning are the same as for the 3/4-meter and 2-meter antennas. Provide a loop of nylon line at the top so that it can be hoisted and suspended by it. When using the antenna, seal the coax connectors with a plastic bag and tape to keep water and dampness out. ■

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A 10-MHz Antenna for $10

If you're still not on 30 meters, the Hanging Helix may be your last chance.

Guy Slaughter K9AZG
753 W. Elizabeth Drive
Crown Point IN 46307

The old-fashioned delta loop, when fitted with a newfangled "Hanging Helix," makes a cheap but superb antenna for the recently opened 30-meter band.

You've never heard of a "Hanging Helix"? Me neither. It's just a name I coined for a gadget I made to perform multiple-duty assignments on a 10-MHz antenna, or one for any other band.

A full-wave loop, whether in quad or delta form, presents a feedpoint impedance of around 100 Ohms at normal heights above ground, depending somewhat on the nature of surrounding objects. And it is a balanced antenna whose radiation pattern and, hence, efficiency suffer when fed with an unbalanced feedline.

It is necessary when mating a full-wave loop with a 50-Ohm feedline, therefore, to contrive both an impedance-transforming system and some sort of a balanced-to-unbalanced conversion device.

The Hanging Helix performs both these functions, plus two mechanical chores as well. It is a quarter wavelength of 75-Ohm RG-59/U coaxial cable wound into a coil on a homemade form that also serves as the antenna's feedpoint insulator and as the anchor for the feedline. Thus, it converts the antenna's 100-Ohm-plus feedpoint impedance to the 50 Ohms of RG-8 mini-coax and acts as a choke-type balun preventing antenna currents from appearing on the shield of the feedline to alter the antenna's radiation pattern.

This multi-purpose gadget is easy to make from commonly available materials. In use, it converts a full wavelength of wire hanging from two trees—or two anythings—into an efficient and rewarding antenna.

When the new 10-MHz band was suddenly opened last October, it caught some of us with our pants down—or at least without anything up in the air cut to resonance on that frequency. A lot of eager beavers fired up 40-meter wires through their tuners and some of the guys even loaded up their tribanders in their hurry to try out the new megacycles.

I was prepared, sort of. I had a quarter-wave vertical up, arranged to work as a ground-plane antenna against the chain-link fence that is the ground system for my 160-meter and 80-meter inverted Ls. So, when the go-ahead came, I got in there and went, working out well enough to bag a few Europeans and even a VK3.

But I had troubles in the

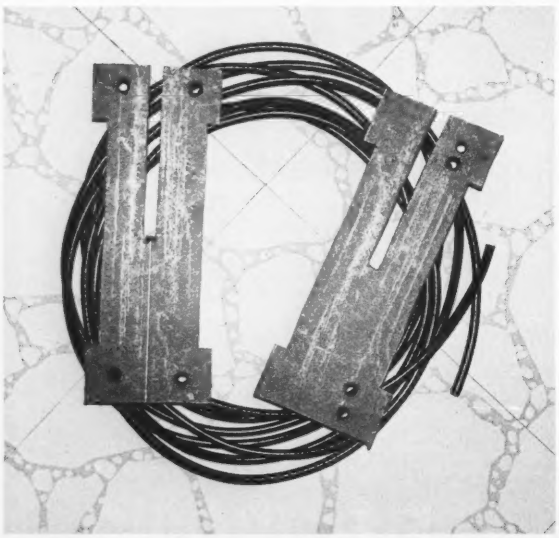

Photo A. Components of the Hanging Helix after sawing and drilling of the coil-form pieces from "waterproof" Masonite and their spraying with polyurethane to make them truly moisture repellent.

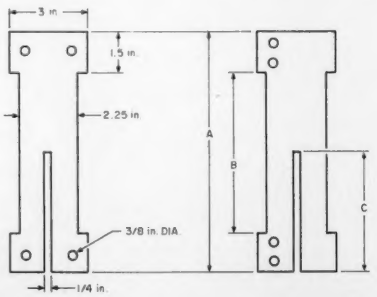

Fig. 1. The Hanging Helix coil forms are identical except for the locations of the 3/8" holes. For 10 MHz, A, B, and C are 9", 6", and 4½" respectively; for 7 MHz, they are 13", 10", and 6½".

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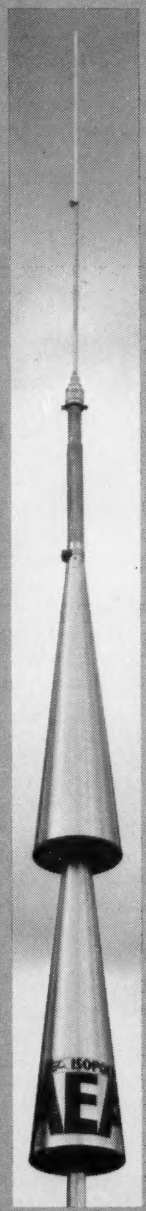

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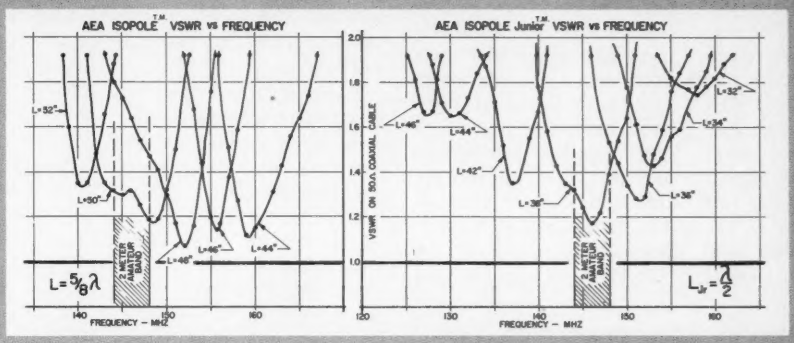
All IsoPole antennas yield the **maximum gain attainable** for their respective lengths and a zero degree angle of radiation. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Cones offer greater efficiency over obsolete radials which radiate in the horizontal plane and present an unsightly bird's roost with an inevitable "fallout zone" below. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other when used with SWR protected solid state transceivers.



Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station antenna. A standard Amphenol 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole, you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. All IsoPole antennas are D.C. grounded. The insulating material offers superb strength and dielectric properties, plus excellent long-term ultra-violet resistance. All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion resistant aluminum alloys. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is **not supplied**).

IsoPole antennas have also become the new standard for repeater applications. They all offer low angle of radiation, low maintenance, easy installation, and low cost with gain comparable to units costing several times as much. Some repeater installations have even eliminated the expense of a duplexer by using two IsoPole antennas separated vertically by about twenty feet. This is possible because of the superior decoupling offered by the IsoPole antennas.

The IsoPole antenna is now available in a 440 MHz version which is fully assembled and tuned.

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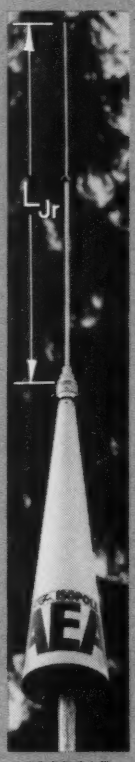

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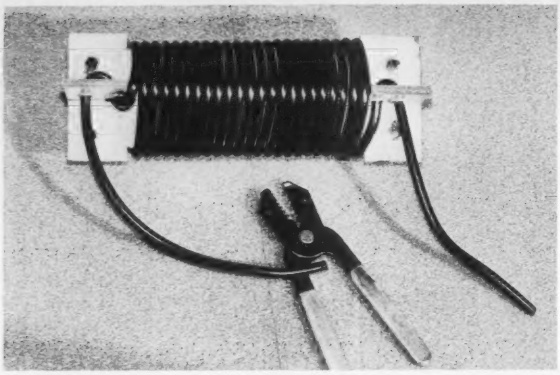

Photo B. The Hanging Helix after the quarter-wave matching transformer of RG-59/U has been wound onto the form.

form of NOISE. I can't speak for other QTHs, but mine is polluted with vertically-polarized man-made QRN that seemingly rises and falls on schedule. The rise, of course, always coincides with band openings that bring in skip signals to gladden the hearts of DXers. And the falls, naturally, always come when the only signals on the band are from just beyond the backyard.

That's the problem with vertical antennas, ground-plane or plain plane: They are noisy. And my new 30-meter GP was among the noisiest I have ever used. I don't know whether all line-leakage rf peaks around that frequency or whether it's a quirk peculiar to the man-made QRN in my neighborhood, but I do know that a delta loop, fed from the bottom and thus horizontally polarized, doesn't hear all that noise. Thus, it is unbelievable to switch to my Hanging Helix loop from the ground plane on even a relatively quiet day and hear signals come up out of the mud. And on a noisy day, the loop makes the difference between operating and deciding to watch the boob tube instead.

If you want to hear those signals-minus-mud in your own shack, you can duplicate my Hanging Helix delta loop easily and cheaply.

I used hardware-store number 14 house-wiring wire, the kind that comes with red, white, or black insulation for about 7 cents a foot, cut to the formula of 1005 divided by the frequency of interest. In my case, using 10.125 MHz as the new band's center frequency, the wire length came out to 99 feet, 3 inches.

Two insulators, threaded onto the wire and twisted into place at 33 feet, 1 inch and at 66 feet, 2 inches from the starting end, formed the base of the triangle that was to become my delta loop. Suspending it base up by those insulators from trees or whatever, high enough so the inverted triangle's apex cleared the ground, converted the tangle of wire into an embryonic antenna.

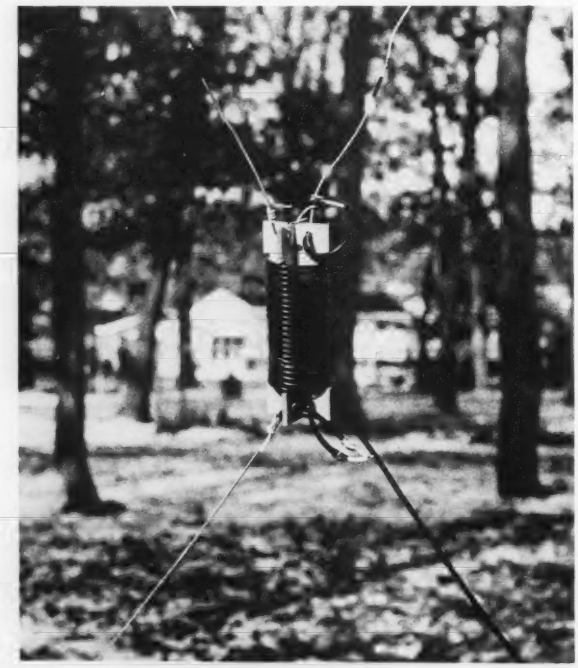

Photo C. The Helix hanging from the delta loop, the antenna wires and feedline attached but not yet taped.

For the Hanging Helix that, together with the feedline, completes such an antenna, you will need two pieces of insulating material, each 9 inches long, 3 inches wide, and 1/4 inch thick. I used "waterproof" Masonite because I have scads of it left over from the era when I "finished" my basement. So-called "waterproof" plywood would do as well, I think, and Plexiglas™—the kind the stores stock for window-pane replacement—would probably be even better.

Each of the two pieces has a 3/8-inch strip 6 inches long cut off its two 9-inch edges, leaving a 1½-inch "T" at each end (see Fig. 1). Saw a 1/4-inch slot up the middle of each piece to the halfway point. Drill 3/8-inch holes near the four corners of one piece and a pair of same-size holes 3/4 of an inch apart vertically near the top and bottom of one side of the other piece. Now slide the slots together so that the two pieces become a single X-shaped coil form. Spray or brush the assembly with polyurethane or a similar waterproofing compound, applying it liberally to the sawed edges and the edges of the drilled holes to keep moisture out.

Cut the quarter-wave impedance-matching transformer, using the formula 234 divided by the frequency of interest times the velocity factor of the particular brand of RG-59/U you will use. I used a center frequency of 10.125 MHz for my 30-meter Hanging Helix which, using Radio Shack's published velocity factor of .75 for its foam coax, figured out to 17 feet, 4 inches.

Weave one end into the top hole of one of the coil form's vertical-hole pairs and out the hole just below it. Leave about 3 inches of cable sticking out for later connections. Close-wind the coax onto the form keeping it tight, the way you wound that very first coil when you were making your very first receiver or whatever. An easy way is to clamp the far end of the cable in a vise or the hinge crack of a door and walk towards it as you turn the form.

You will find that the cable and the coil-form space on which you are winding it will come out even if you stick to the dimensions given and are making it for the 30-meter band. If it's for 40 meters, scale the coil-form pieces up to 13 inches with 10 inches of winding room to accommodate the greater length of cable required by a quarter-wave transformer for that band.

Finish the device by weaving the end of the winding

into the hole of the vertical pair farthest from the top of the form and then through the top hole, pulling it tight to anchor it. Remove about two inches of the insulating jacket from each end of the coax, comb out the shield braid, twist it into a stranded wire, and remove about 3/4 inch of insulation from the center conductor.

Now take the whole works outside, feed the apex-end wires of the embryonic delta loop into the corner holes at one end of the form, twist each wire around itself to anchor it, strip back about 3/4 inch of insulation from each, and solder one wire to the center conductor of the coax and the other to its shield.

Push one end of your 50-Ohm feedline into one of the corner holes at the bottom end of the Hanging Helix, then through the other hole, and pull it tight to anchor it, leaving enough loose end to make your connections. Solder its center conductor to the center conductor of the coiled cable, solder the shield braids together, tape to prevent moisture entry, and your Hanging Helix delta loop is ready to pump rf into and out of the atmosphere.

Like any other antenna, this one follows the old "the higher the better" rule of thumb. But even with the feedpoint barely clearing the ground, you'll get out. Mine is about 10 feet up, and I prevent excessive wind sway by tying a light nylon anchor line between the coil form and a brick lying on the ground beneath it.

My in-line swr meter reads a flat 1 to 1 across the 30-meter band and well above and below it. My noisy reception is gone. My signals get out and I work what I hear. The Hanging Helix went up about two weeks after the new band was opened to us and has been in use for about six weeks as of this writing. In that time, my TS-830S, running barefoot, has racked up 18 countries for me despite sparse operating hours. I need only Asia for WAC on 10 MHz, and I'm told the band is full of workable Js in the early-morning hours. I wouldn't know, though, because I'm a devout sleepyhead.

That's all I can tell you except to warn you against locating two such antennas side by side or overlapping each other. I learned the hard way that adjacent 30-meter and 40-meter loops interact so that pruning one detunes the other. If they are hung concentrically, however, the 30-meter loop within the 40-meter loop with the wires spaced reasonably equidistantly around the perimeters, such interaction is minimized or eliminated. If you use this arrangement, you'll find that running the 30-meter Hanging Helix feedline down past the 40-meter Hanging Helix and taping it to the 40-meter feedline won't affect tuning or degrade the performance of either antenna.

That's the story, except for an apology for its title, which isn't quite accurate. In the first place, the new band isn't exactly centered on 10 MHz, and it has an FCC-ordered hole in it—a frequency "window" that is taboo to American hams. And, in the second place, I paid $7 for the antenna wire at my local hardware store, $2.80 at Radio Shack for the RG-59/U matching cable, and had the feedline, the Masonite, and a can of polyurethane on hand. But I also paid sales taxes of 28 cents for the wire and 11 cents for the coax.

I hope you'll forgive me for my untruthfulness, however, because such strict accuracy as "Build a 10.1-to-10.09- and 10.015-to-10.15-MHz Antenna for $10.19" would make a rotten title. ■

Photo D. The author tying on light nylon anchor line before hauling the delta loop skyward. At K9AZG, the Helix hangs about 10 feet off the ground, with excessive wind sway prevented by the "anchor," a brick lying on the ground beneath the antenna.

Orbit

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Guy Slaughter K9AZG
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Slaughter's Sway-Bar Forest

Are trees an antenna hindrance? Or are they the means to the best antenna collection you ever had? It just depends on your outlook.

Antenna farms are nice, but not many of us have the space, the time, the money, or the inclination to be antenna farmers. Antenna orchards, on the other hand, are within the reach of every ham with a chunk of property under his control on which God has made some trees.

I am an antenna orchardist, and I find it rewarding.

I have wire antennas for 160, for 80, and for 40 meters strung up in my trees. They don't have the gain nor the directivity of my triband yagi, which is atop a conventional tower like everybody else's, but they do get out, they do allow me to copy my contacts, and they give me what most of us call all-band capability.

My lot is full of 50-foot, 60-foot, and even 70-foot oak, maple, and locust trees that in times past I begrudged yard space because three seasons of the year they make my tribander look into heavy masses of foliage in three directions. Now, however, I am happy with the trees, because some of them serve as towers for my wire antennas as well as giving shade for the lawn and sanctuary for squirrels and birds.

I have a length of nylon rope strung between two of them that are around 100 feet apart. From it hang the vertical portion of an inverted L cut for 1,840 kHz (the horizontal section of which runs along the support rope), another inverted L pruned for 3,750 kHz, a quarter-wave vertical wire cut for 7,050 kHz, and a delta loop (the resonant frequency of which centers on 7,150 kHz).

The suspension rope and, therefore, the top ends of all except the 40-meter vertical are about 60 feet up. The bottom ends of the vertical and the Ls are fed against a ground system that consists of the top pipe of a five-foot-high chain-link fence. The

Photo A. Because trees bow and curtsy in the wind, and because vertical wires suspended from them thus dance up and down, some sort of flexible bottom-end tie-down is needed if an antenna orchard is to survive heavy gusts. I devised a "sway bar" system to beat the wind. Here, I'm checking its position. It's a five-foot fiberglass fence post tied with two screen-door springs to another such post strapped to the top pipe of a chain-link fence. The springs stretch and contract in the wind, maintaining tension on the vertical wires. The spiral pigtails wound into the antenna elements allow them to flex as the sway bar moves up and down.

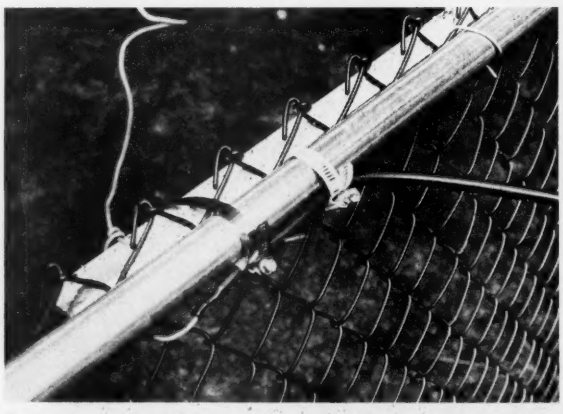

Photo B. Each of the antennas in my orchard is fed with a separate coax feedline. One of them is shown here. The left-hand hose clamp fastens both the fiberglass fence-post insulator to the top pipe of the chain-link fence that is my ground system and the coax braid to the grounding pipe. The right-hand clamp provides strain relief to eliminate pull on the grounding connection and the joint between the feedline and the antenna element. The first half-turn of the pigtail coil wound in the element between the insulator and the sway bar is visible at the upper left.

delta-loop feedpoint dangles about 12 feet above ground, connected to a homemade triangular insulator fashioned from Plexiglas™ that supports a commercial balun salvaged from a now-forgotten earlier antenna. A length of polypropylene rope tied to a brick resting on the ground keeps it from swinging in the wind.

The top of the 40-meter vertical wire ends in an insulator to which is tied a length of polypropylene line just long enough to suspend the antenna's bottom end at the grounding pipe.

I have a fiberglass electric fence post, one of those triangular jobs five feet long, clamped to the top pipe of my chain-link fence as a long insulator for all three of the vertical-wire antennas, and a second such post suspended about 18 inches above it as a "sway bar." Trees do sway in the wind, you know, bowing and curtsying to the breezes and even genuflecting to heavy gusts. The sway bar eliminates problems of too much wire tension when the wind lifts the treetops and too little when it sags them. It is tied to the insulator post with a pair of light screen-door springs. Thus, it can be pulled away from it, under tension, when the wind blows the treetops up, and can resume its original position, retrieving the slack, when the wind blows them down.

The sway bar is drilled with three holes for each of the three vertical wires it carries. Each wire is woven through the trio of holes to fasten it to the sway bar in a fixed position that can be adjusted up or down and locked in place by pulling the wire taut.

Each of the vertical wires is allowed about 18 inches of extra slack between the sway bar and the insulating post. The excess is wound into pigtail coils that lengthen and shorten as the wind moves the sway bar up and down. The vertical movement and flexing is thus confined to these flexible pigtails, and there is, therefore, no wind stress on the feedline connection to the antenna wires and no flexing of the solder joints.

The jackets on the separate 50-Ohm coax feedlines for the verticals are cut back about two inches, an inch or so of braid is uncombed and folded back over the uncombed section, and that portion of each feedline is squeeze-grounded to the top pipe of the chain-link fence with a hose clamp. A second clamp provides strain relief for each. The antenna wires are soldered to the center conductors of their respective feedlines and the joints are insulated with heat-shrink tubing.

I match the delta loop's impedance of about 100 Ohms with a quarter wavelength of 72-Ohm RG-59 between the 1-to-1 50-Ohm balun and the feedline.

All of the feedlines, together with the coax from my tribander, go into my garage where I have a remotely controlled five-antenna coax switch, wall-mounted, whose selector control is at my operating desk in the basement shack. A single run of RG-8/U connects my TS-830S and/or my Yaesu linear to any of the antennas at the turn of the selector-switch control knob.

None of the antennas in my orchard is either exotic or sophisticated, obviously. But all of them work well.

The delta loop is cut to frequency using the formula 1005/frequency in megahertz. It is a 140.5-foot length of #14 house-wiring wire, insulated with neoprene and formed into an approximately equilateral triangle a bit over 46 feet on a side, fed at the open bottom. That makes it horizontally polarized. Running roughly north and south, it displays little directivity and seems to work equally well into Europe, South America, Alaska, and Hawaii.

The 40-meter vertical is seldom used since the delta loop consistently provides better signal reports and better reception. But it's there for comparison purposes, and if I ever need it—for whatever reason.

The 80-meter inverted L, likewise, is seldom used, simply because I don't often get on either 75 or 80.

But the 160-meter inverted L is frequently pressed into service and, working against the chain-link-fence ground system, gets out remarkably well. It, like the 80-meter inverted L and the 40-meter vertical, also is #14 neoprene-insulated house-wiring wire. All three are cut from the quarter-wave formula, 234/frequency in megahertz. The 160-meter wire is 127 feet long, the 80-meter wire is 62.4 feet long, and the 40-meter wire is 33.2 feet in length.

Getting them up into the trees was no problem at all. Using a slingshot borrowed from the junior op, I used an old spark plug as a projectile, tying to it monofilament fishing line feeding from the reel of a spinning rod laid on the grass beside me.

It took a few tries to get the spark plug over the selected branches, but pulling a light line into the treetops with the fishing line was simple enough, and then hauling the heavier nylon rope up as a permanent suspension line was child's play. It is long enough so that I can lower the center section all the way to the ground, tie antennas to it, and haul it—and them—up to the sky.

That's the story of my antenna orchard. If you can afford a full-scale antenna farm, go to it and happy acres, friend. But if you can't and have a few trees around, you might try orcharding. I think you'd like it. ■

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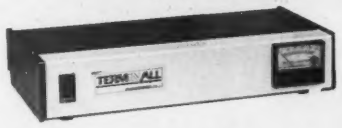

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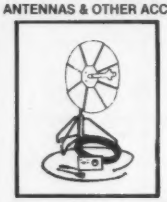

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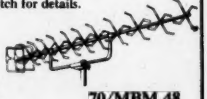

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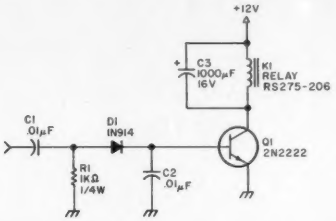
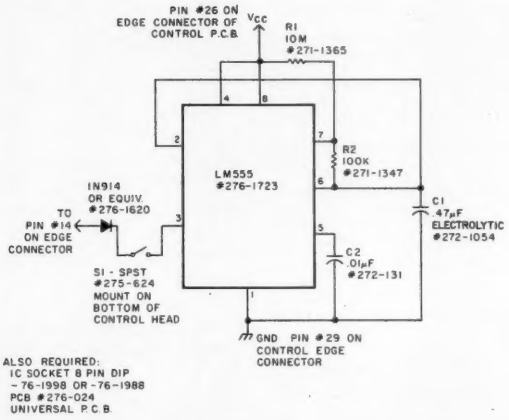
CIRCUITS

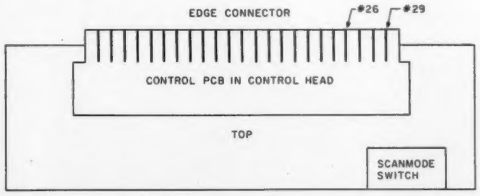
Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



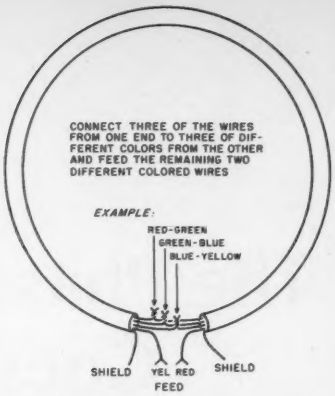
RF-ACTUATED RELAY: Here's a simple circuit to add automatic antenna switching to your home-brew power amplifier. This relay will key with less than 150 mW of drive on 2 meters.—Don Bohm WB0FLG, Sauk Rapids MN.





SCANNING RESUME FOR THE AZDEN PCS-2000: When scanning, the Azden 2000 will lock on a busy channel until the carrier drops, unless this modification is added. The 555 is wired as an astable, with three connections to the control-head PC-board edge connector: pin 14, the SQC line running from the discriminator section to the scanning control logic section; pin 26, which provides 13.8 V to the circuit; and pin 29, which is the ground. The time duration is determined by the resistance and capacitance values; the values given will allow the Azden to resume scanning after five seconds. By wiring the circuit on an 8-pin DIP socket, you will be able to mount it in the control head of the radio.—Kurt R. Fritsch WA3TOY, Glen Burnie MD.

See List of Advertisers on page 114



SIMPLIFIED LOOP WINDING: A recent article described the construction and use of shielded loops for receiving under noisy conditions, but the author deplored the difficulty of sliding multiple turns through a shield. The easy way is to use shielded telephone cable. One standard form of cable has four wires coded yellow, red, green, and black, surrounded by an aluminum foil shield with a bare wire running under it. Just form the loop to whatever size is required, connect three of the wires from one end to three of a different color from the other end, and feed the two remaining wires.—William Bruce Cameron WA4UZM, Temple Terrace FL.

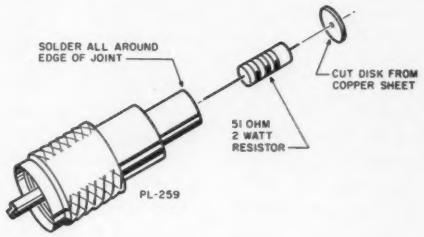


Fig. 1.

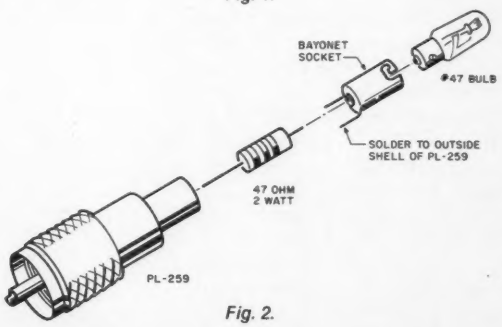


Fig. 2.

TWO VHF DUMMY LOADS: Fig. 1 shows a simple dummy load useful for frequencies at least as high as 220 MHz. It is a well-shielded load and can handle up to 5 W intermittently. To make the dummy load, insert a 51-Ohm, 2-W carbon resistor into a PL-259 connector. Solder one end of the resistor to the center conductor, making sure that the body of the resistor is completely inside the barrel of the connector and that only the resistor's lead sticks out past the body of the PL-259. Cut a disk out of copper or brass sheet (shim stock works well—even a penny can be used), drill a hole in the center, and slip it over the resistor lead, fitting it snugly against the end of the connector. Solder all around the edge of the disk and the lead in the center. File off the excess disk material. Fig. 2 shows a modified version that will give a visual indication of relative rf power as well as provide a 50-Ohm load. The dummy will handle up to 5 W intermittently and will indicate output as low as ¼ W.—Craig Crichton K7UKW, The Dalles OR.

The Phase-Shift Oscillator Goes Hollywood

This circuit can be the star of your audio designs. All it needs is a tweak here and a taper there.

Curtis C. Goodson
Av. Francisco Glicerio 467
Apartment 502
13100 Campinas, Sao Paulo
Brazil

The phase-shift oscillator is noted for good stability and a clean sine wave. It also uses a very simple circuit. Hence, many hams attempt to use it when an audio oscillator is needed, only to discover that "it won't oscillate." The beta of the transistor is most often blamed for the difficulty. Although it is true that a rather high beta is needed to overcome the loss in the phase-shift network, with today's transistors a high beta is easy to find and still "the shiftless thing won't oscillate."

Most often the phase-shift network is taken from tube circuitry without being adapted to transistors. In the tube circuit, the network is fed from the high impedance plate and terminated in the even higher impedance of the tube's grid. When a bipolar transistor is substituted, the network is fed from a fairly high impedance but feeds into the low impedance of the base. Therefore, a high-to-low impedance transformation should be included in the network design. Tapering the values of the network components will do it. Make R_{out} about ⅓ of R_{mid} and R_{mid} about ⅓ of R_{in}. (See Fig. 1.) Then, to keep the phase shift at 180°, make the RC products of each section the same: $R_{out} \times C_{out}$ equal to $R_{mid} \times C_{mid}$ and to $R_{in} \times C_{in}$.

In the circuit in Fig. 1, the collector load resistor of 33k Ohms serves as R_{in}, so R_{mid} is about ⅓ of that, or 10k Ohms, and R_{out} is ⅓ of R_{mid}, or 3.3k Ohms. To keep the RC products equal, C_{mid} is 3 $\times$ C_{in} and C_{out} is 3 $\times$ C_{mid}. The approximate frequency of oscillation is found by the formula: $f = 1/11RC$. For the values in the example, the frequency will be about 600 Hz.

The resistor from collector to base biases the transistor and should be chosen for best waveform and output. A value from one to one and a half megohms will be about right. The output is taken from the collector, but be careful not to load down the high impedance of the network.

If those "computer surplus" transistors just do not have enough gain, use a pair of them in a Darlington connection, as shown in Fig. 2. You'll probably have so much gain that it won't be necessary to taper the network values.

Minor frequency adjustments can be made by altering just one or two of the resistors or condensers. The 500k-Ohm potentiometer is adjusted for best waveform. A double-pole switch can be inserted at x-x to select networks for different frequencies, but the pot may need readjusting each time. Since transistors are so cheap, why not build a separate oscillator for each frequency? No transistors are specified since almost anything will work. ■

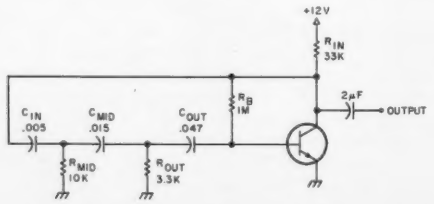


Fig. 1.

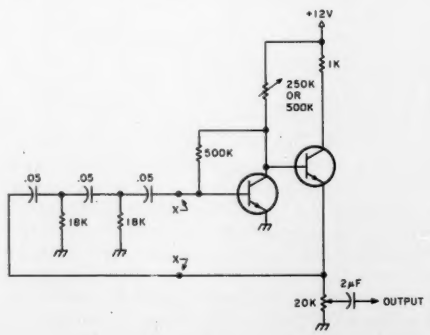


Fig. 2.

PROJECT PACKS

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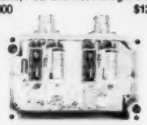
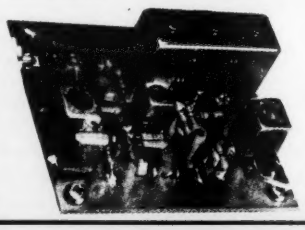
GaAs FET 2m PRE-AMP
Masthead mounting, environmentally enclosed
Relay switching for up to 400W PEP
Power and relay switching via coax feeder

Bandwidth (1dB)	6 MHz
Noise Figure	less than 1 dB
Gain	17 dB
Supply voltage, current	12V, 180mA
Input/Output impedance	50 ohm
Kit includes all parts, PCB and weathertight enclosure	
Stock No. 40-47000	$123.50*



2m CONVERTER
Low-noise MOSFET circuit utilizing a 3 cavity helical filter

Frequency coverage	144-146 MHz
Output (IF) frequency	28-30 MHz
Gain	28 dB nominal
Noise Figure	less than 2.0 dB
Supply voltage, current	8-16 V, 15 mA at 12 V
Input/Output impedance	50 ohm
Kit includes all parts, PCB and enclosure	
Stock No. 40-01030	$37.50*



70cm PRE-AMP
Compact low-noise circuit for 432 MHz

Bandwidth (3dB)	20 MHz
Noise Figure	less than 2.0 dB
Gain	13 dB
Supply voltage	8-16 V
Input/Output impedance	50 ohm
Size	50mm × 10mm × 17mm
Kit includes all parts and PCB	
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23cm CONVERTER
Low-noise low cost microwave (1240-1325) converter

Frequency coverage	1296-1298 MHz
Output (IF) frequency	28-30 MHz or 144-146 MHz
Gain	0 dB
Noise Figure	5.5 dB
Input/Output impedance	50 ohm
Supply voltage, current	10 V regulated, 95 mA
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Low MOSFET circuit

Frequency coverage	432-434 MHz
Output (IF) frequency	28-30 MHz
Gain	28 dB nominal
Noise Figure	1.8-2.5 dB
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Input/Output impedance	50 ohm
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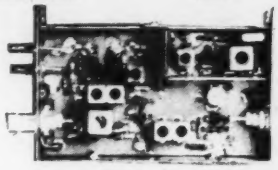

2m PRE—AMP
Very compact low-noise MOSFET circuit

Bandwidth (3 dB)	6.0 MHz
Noise Figure	less than 1.5 dB
Gain	22 dB
Supply voltage, current	8-16V, 25mA
Input/Output impedance	50 ohm
Size	34mm × 9mm × 15mm
Kit includes all parts and PCB	
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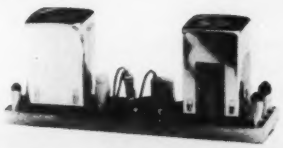

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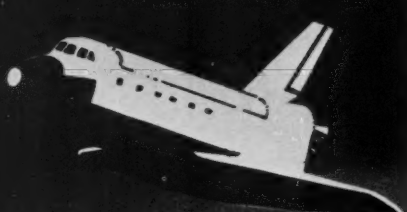
FOR A TRULY "OUT OF THIS WORLD" EXPERIENCE we'll be celebrating both the 15th Anniversary of man's first moon landing AND the first off-world amateur radio operation during the STS-9 Spacelab-1 mission. Our special guest will be astronaut **DR. OWEN GARRIOTT, W5LFL,** first ham to operate from space! You can meet W5LFL in person, at the Moon Landing Anniversary Party on Friday evening, July 20th, AND hear him speak at the Banquet on Saturday evening, July 21st.

IMAGINE, THE MOST IMPORTANT ARRL NATIONAL EVER HELD...AND YOU CAN BE THERE! Register now to assure your room and banquet reservations. For detailed information and registration forms, SASE to Mike Troy, AJ1J, R.R. 4 – Box 19C, Pound Ridge, NY 10576.



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Build the Harmonic Zapper

When the TV starts sounding like Donald Duck, you need this 20-meter trap.

John Labaj W2YW
12 Park Place
Elsmere NY 12054

When I got back on the air after a long layoff, I ran into some really severe interference problems. I interfered with every working television channel on all television sets in the house. My signals rode in on the Hammond organ, jammed the telephones, and made most of the lights in the house flicker.

Over the years I cleared the lights, organ, and telephone lines of all interference and reduced the TVI to where I could operate with full power on forty meters with just a faint trace of interference on channel six. It was too slight to be objectionable. The other channels were perfectly clear.

However, when I tried to operate on twenty or higher, channel six would be wiped out. Being of a lower order, the amateur harmonics from the higher bands were stronger. No attempt at a cure seemed to have any effect. Low-pass filters were useless. They absorbed power and heated up or broke down. Reluctantly, I came to the conclusion that maybe I had reached the limit as to how much TVI I could eliminate. As a result, most of my operating was on forty.

One rainy Sunday when QRN made forty meters just about a total loss, I decided to make another attempt to lessen the TVI problem. Although I had tried an open-ended quarter-wave stub across the line, I decided that perhaps a combination of a shorted stub and an open stub would be more effective. The shorted stub, in series with the feedline, would represent a parallel tuned circuit and thus be a high impedance at the harmonic frequency. The open stub, across the line at the output end, would act as a coil and capacitor in series and would be a very low impedance at the harmonic frequency. They would have no effect on the operating frequency.

In very short order I had the trap made up. I installed it in the feedline and tuned the rig up on twenty meters. I set the keyboard up for automatic keying and went around the house checking channel six and other channels for TVI. Not a trace. In fact, reception was so clean that I went back to the shack to see if the transmitter was being keyed. It was.

I tried the other bands. Still no interference. I ran the transmitter for about fifteen minutes to give the trap a smoke test. The trap remained cold. Furthermore, the trap had made no noticeable change in the line current, the loading, or the tuning.

As a final test, I loaded up the amplifier (four 572Bs) heavy, raised the grid bias voltage to 250 volts, and increased the drive to 250 mA of grid current to really squirt out a lot of harmonic power. Still not a trace of TVI. The trap really was a killer.

Let me tell you how I built the harmonic killer. Bear in mind that this idea will work on other channels. You can even hook these traps up in tandem in case you have more than one trouble spot.

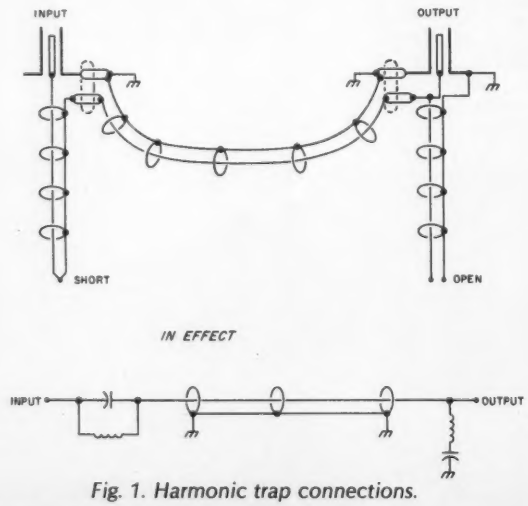

Fig. 1. Harmonic trap connections.

To cut the stubs to the right length, I used the familiar formula $L=(246 \times V)/F$, or $L=246V/F$, where L is in feet, V is the velocity factor or the coaxial cable, and F is the frequency in megahertz.

Since I operate mostly in the low end of the bands, I selected 84.15 MHz as the target frequency. However, I later found out that the trap is effective over a broad range of frequencies. Using 84.15 gave me a stub length of 1.929 feet (about 23 and an eighth inches).

Here is a list of materials I used. Since it was a Sunday, I made do with what I could find around the shack. Also, I wasted no time or money running to the parts store. I do not consider this the ultimate in trap construction. Your ideas may be better, but this trap is easy to build and it works.

- Two 6-inch tomato cans. These are seven inches high and are free from your favorite restaurant or their rubbish pile. (I use them for storing parts.)
- Two SO-239 female coaxial cable fittings.
- Two tiepoints with one ground lug and one insulated lug.
- One plastic bottle or plastic container used for detergents or sour cream about 3 or 4 inches in diameter and about 6 inches high.
- Enough RG-8/U to make up the two stubs plus about 9 inches to connect the two SO-239 fittings together.
- A few nuts and bolts to put the pieces together.
- Some lacing twine or heavy string.
- Some fingernail polish—or something similar.

Using tin snips, cut one can down so that it is only about an inch and a half high. The other can requires no work. On the cut-down can, make some vertical cuts with the snips so that later on you can bend in the side and nest this can into the other can.

Mark a diameter on the bottom side of the can. Five-eighths in from each edge punch two five-eighths-inch holes to take the SO-239 fittings. Use an upside-down SO-239 fitting as a template and mark and drill two mounting holes for each fitting.

Take the tiepoints and enlarge the holes in the lugs and also the hole in the foot (ground lug) by putting the tip of your needle-nose pliers in the holes and turning.

While mounting the SO-239 connectors, bolt a tiepoint (using the same bolt) at each connector.

Lay a piece of coax along the edge between the two SO-239 connectors so that you can judge how to cut and prepare the ends. When you have the short coax cut and prepared, connect the inner conductor to the insulated lug of a tiepoint using the lower hole. You may have to file the wires a little to fit in the hole. Connect the shield which you twisted into a pigtail to the grounded lug. Solder both. The SO-239 connector at this side will be the input end and will go to the output of the transmitter.

At the other end of the short piece of coax, run the inner conductor (which you made about an inch longer) through the lower hole of the insulated lug and continue until you push the end into the solder hole of the SO-239 connector. Solder both. Solder the shield to the ground lug using the lower hole.

Prepare the plastic container by drilling several mounting holes in the bottom. Place them far enough away from the side so you can reach the bolts and nuts. Also drill a row of closely-spaced holes at all four quadrants of the container. These will be used to tie the coax to the form.

Center the plastic container between the two SO-239 connectors and mark the location of the two holes so that you can drill the bottom of the can and mount the plastic container.

To make the stubs, remove about an inch of the outer jacket from an end of coax. Unravel the shielding and twist it into a pigtail. Cut off about half an inch of insulation from the inner conductor. Since this is going to be the input of the trap, the high impedance side, shape the inner conductor and file to fit into the inner contact of the SO-239 fitting. The shielding braid is going to be part of a hot circuit, so it will connect to the insulated lug—the one where you already have connected the inner lead of the short coax. Solder both.

Inspect the connections to make sure there are no loose strands to short things out. Stretch the coax out and measure from where the shielding is formed into a pigtail along the coax for the proper distance plus a quarter of an inch for making the short between the shield and the inner conductor. Cut the coax. Strip off about a half inch of jacket, push the shielding back, and remove a quarter inch of insulation from the inner lead. Clean the wires, pull the shielding forward, twist it around the inner lead, and solder.

For the open-ended stub, the one in shunt with the line, prepare the ends as before. Connect the inner conductor to the insulated lug which already is connected to the center contact of the fitting. Connect the shielding which you formed into a pigtail to the grounded lug. Again measure off the right length, but do not allow a quarter inch for shorting the conductors together since this end will be open. Check the cut end to make sure there is good clearance between the shield and the inner conductor. Paint the end with fingernail polish.

To wind the stubs on the form, start with the stub that has the shield grounded since it will not be sensitive to capacity effect. Wind the stub around the form, lacing and tying it as you go along. Use a folded piece of #18 wire for a needle. If you cannot get your hands into the form, use long-nose pliers to thread the needle through the holes. Space the turns about two inches apart. When you have the one stub tied down, do the same with the other stub, winding and tying it between the other turns. The two stubs should be about an inch apart. Check all work.

Paint the joints, the nuts, and the knots with fingernail polish.

Nest the can on which the trap is assembled into the other can, pushing down as far and as evenly as it will go. You can either spot-solder the two cans together or use some tape to hold the assembly tight.

One last comment: After I got through admiring the trap, I fastened it to the tree holding up the dipole. I used a plastic pail for an umbrella. ■

Parts List

5½′	Belden #8237 RG-8/U coaxial cable	$1.93
2	Amphenol-type SO-239 connectors	.80
6	8/32 half-inch plated bolts and nuts	.72
6	Washers—four lock-type, two flat	.12
2	Six-inch-diameter tin cans, 7″ high*	N/C
1	Plastic container 3-4 inches in diameter and 6″ high**	N/C
6′	Lacing or other sturdy twine or carpet thread.	N/C
	Elmer's Glue or fingernail polish. Small amount of solder.	N/C
	Total	$3.57

* Three-pound coffee can; restaurant-size tomato or mushroom cans are free from most restaurants for the asking.

** Soft drink, shampoo, instant tea, marshmallow whip, and many other items come in suitable bottles or containers.

Richard Silberstein WØYBF
3915 Pleasant Ridge Rd.
Boulder CO 80301

The Anti-Gravity Antenna-Erection System

Now you can put your wire antennas as high as you want—maybe.

Joyce Kilmer once wrote:
I think that I shall never see
A poem as lovely as a tree.
But trees mean different things to different people. Personally, I can never visit a tropic island and see a home surrounded by tall coconut palms without mentally projecting an antenna farm onto those trees.

Early History

In 1948, when I moved into a house in Washington, DC, surrounded by trees, I was faced with the problem of erecting wire antennas without ever having acquired climbing skills. By 1950, I had begun to study how to use a bow and arrow to accomplish this, and by 1952, I was the author of a published article outlining problems and procedures.[1]

In seeking ways of getting a rope up over a tree limb, I immediately rejected any method which employed a pistol or other firearm as unsuitable for most civilian purposes. A group of techniques concerned with a slug, fishing sinker, rock, or ball attached to a line, thrown by means of a hand pitch, sling shot, or casting rod, were rejected after some early experimentation with a small rock on the end of a line. A problem would develop if the object came down over a limb with only a little line to spare and wrapped itself around this limb. On one occasion, it became evident that such an object, suspended over a sidewalk, constituted a real hazard; it was removed with the help of the Fire Department using a hook and ladder.

The choice narrowed down to a bow and arrow—the arrow, of course, being blunt-nosed. The idea was to fire a light line over a

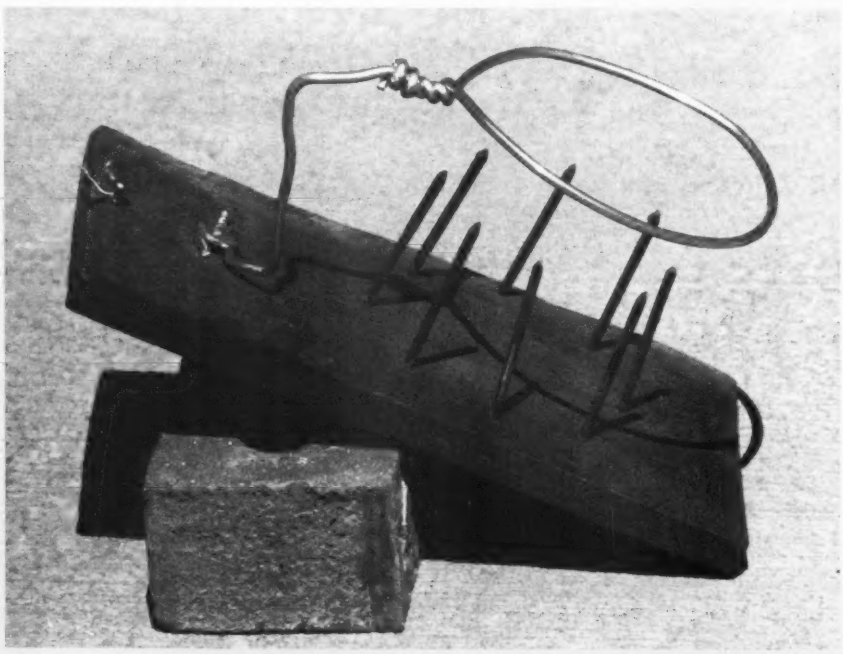

Photo A. Early open-end reel design, using nails and a guide ring.

branch, use it to pull a heavier line, and then follow with a rope. Those days, to ensure the least drag on the arrow, I used what was then known as Size A nylon thread as the initial line, followed by a string known to the trade as carpenters' chalk line. The chalk line was used to haul a 9.5 mm (3/8") rope. Since these lines, when pulled, tended to catch in small crevices and crotches, it was necessary that the junction between one line and the next be wrapped in a conical fashion with smooth waterproof tape, as shown in Fig. 1.

Fig. 1. Tapered line joint.

The arrow itself had to be just heavy enough to come down by its own weight, dragging the line after it. In those instances where the shot was terminated with the arrow suspended out of reach, a slight jiggling of the other end of the line sometimes was needed to make the arrow slide again. The arrow I finally chose was a straight section of 8 mm (5/16") wooden dowel, 66 cm (26") long. Tail fins made of tape were essential to keep the arrow from tumbling, three being used. I notched the tail end of the arrow to fit the bowstring. I made a notch near the tail; its purpose was to clinch the end of the line, which was knotted.

One of the most difficult maneuvers I ran into in the early days was that of getting the arrow to drop over a desired branch in a grove of trees. Sometimes the arrow would come down and drag the line over a branch of a tree farther away than the one intended. It was frequently possible, with care, to withdraw the line slowly, while jiggling at the same time, in such a manner that the arrow came back over the unwanted branch and fell again, pulling the line over the correct branch. Fig. 2 illustrates the case.

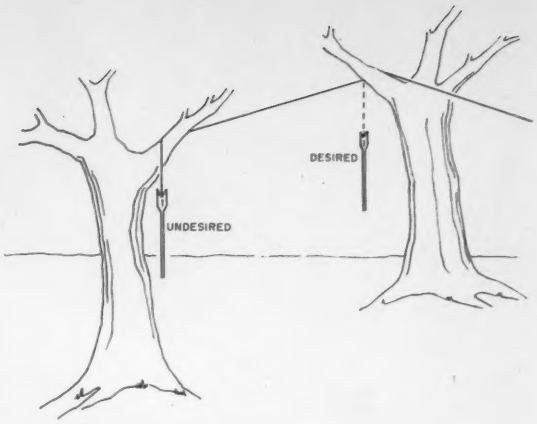

Fig. 2. Arrow falls in wrong tree.

Storing and launching the line required a special technique. Whether I was pitching a rock tied to a line or firing an arrow, letting the line lie in random fashion on the ground resulted in snagging on irregularities, blades of grass, and trash. My initial solution was suggested to me by an unknown Air Force enlisted man who happened to be browsing in the same sporting-goods store where I bought my first bow.

My first line-launcher system had eight large nails laid out in a circle, protruding through a small board so as to form a crude open-face reel. (Remember, this was before the time of spinning reels.) In making a shot, I set the reel on the ground and aimed it like an artillery piece, propping up the little board with a stone. In retrieving the line, I wound it back on the reel by hand, taking care not to gash my hand on the ends of the nails. Problems with occasional snagging of the line on those nail ends led me to devise a wire guard ring held to the board by means of a vertical section and a wing nut. Before retrieving the line, I would release the guard ring, which would then float on the line, sometimes getting tangled.

I was not the first to use the bow-and-arrow technique, apparently. Many years ago someone informed me that he had seen an earlier article in *CQ* magazine.

Later Developments

In later years, I decided to sacrifice some of the range available with a light nylon thread as the line so as to have a line strong enough to haul the final antenna rope, thus eliminating the need for an intermediate hauling line. I began using woven-nylon casting line of 20-pound test strength. Also, for Field Day operations, I found nylon parachute cord satisfactory for wire antennas supported by trees. I kept the same arrow specifications but found that two tail fins still provided stability. For suitcase portability, I made some shorter arrows.

One big improvement was my replacement for the open-face line launcher described above. For my new design, I fastened the top of a peanut-butter jar to a small board and then screwed the inverted jar into its lid. The outside of the jar became the open-face reel. Initially, I used a guard ring as before. Finally I resorted to an eyelet suspended above the jar on a dowel stick mounted far enough away from the jar so as not to interfere with rewinding, so that nothing would have to be removed for retrieval of the line.

I call this line launcher, illustrated in Fig. 3, the PBJL (peanut-butter-jar launcher) and advise prospective builders to eat the peanut butter before assembling the device.

For portable operation, I found it desirable for everything to be short enough to fit into a standard suitcase. I had previously designed a vertical whip antenna using a fiberglass mast in 61-cm (2-foot) sections, each section being socketed to the next by means of drilled wooden dowel segments cemented to the sections. By plugging two of these mast sections together, I have a 122-cm (4-foot) archery bow. A nylon string of the right length fastened at each end to eyelets on wooden caps drilled for the fiberglass rod diameter provides me with an instant portable bow ready for use. Fig. 4 shows the components.

I found that the mast for an all-terrain vehicle safety-warning pennant is an excellent low-cost source of fiberglass stock. The type purchased was The Detector, Columbia Products Co. (subsidiary of Shakespeare Co.), PO Box 4470, Columbia SC 29240.

Noticing the improvements in fishing reels over the years, I thought it would be interesting to see what a spinning reel would do for storing and releasing the line, i.e., as a launcher. I had been reluctant to make any tests, fearing that a monofilament line would be too springy in contrast to a woven casting line. Finally, however, a note in *QST*[2] indicated that Larry W3MSN was having success with a

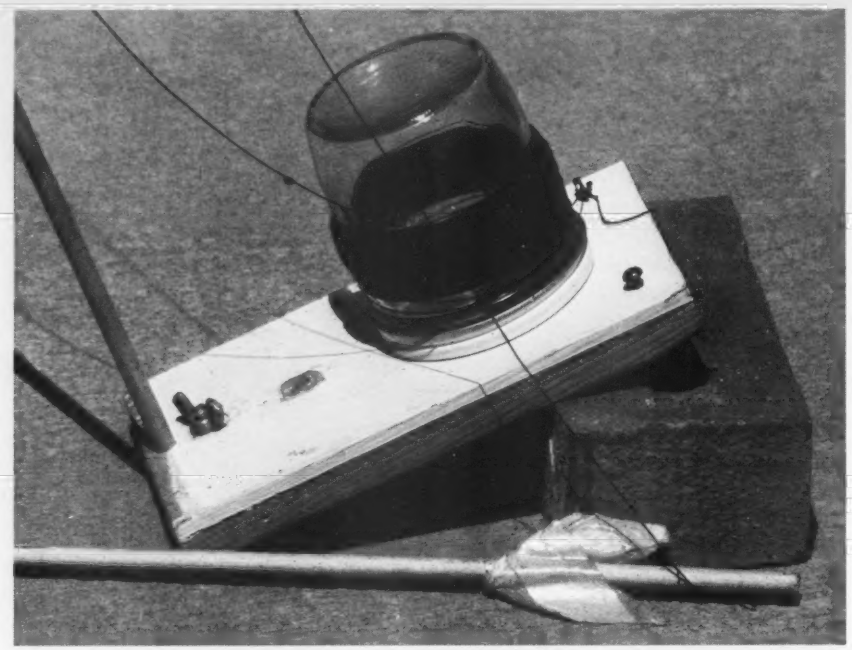

Photo B. Close-up of PBJL line launcher.

closed-face spinning reel, Zebco 202 (erroneously reported as Zebra 202). In looking over the merchandise at a local sporting-goods store, I noted that the Zebco 202 was their least expensive reel, so there was every reason to buy one.

I tried the Zebco mounted on a piece of PVC pipe inserted in a small flagpole bracket and aimed in the desired direction. I used the 8-pound monofilament line which came with the reel. The range was rather good, but, as apparently is true with all spinning reels, the line began to bind on the edge of the spool after a certain amount had come off.

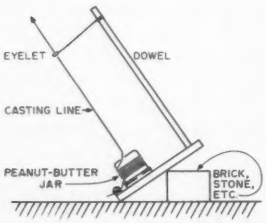

Fig. 3. PBJL launcher.

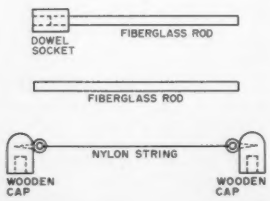

Fig. 4. Portable bow components.

There was a more serious problem, however. For low-angle shots, results were good. Shooting at high angles, however, the falling arrow permitted the line to fall without tension, a situation which apparently does not occur in casting. The monofilament line tangled hopelessly as it approached the ground. Limp, woven-nylon casting line would have been vastly better in this regard. However, I now began to realize that a spool with straight sides actually requires a springy line for the line to be able to hurdle these straight sides in coming off a spinning reel.

Then I made a compensating discovery. It is possible to purchase monofilament lines with different degrees of springiness. The kind with the trade name Trilene is sold in three grades of stiffness. I bought a roll of 8-pound Trilene XL, the least stiff. I followed the advice of a salesman—who said that only the top 3.2 mm (1/8 inch) or so of line would come off a spool without binding—and filled most of the reel with old woven casting line, depositing the monofilament line above this. Success was instant.

Since I was still interested in a line heavy enough for senior citizens' eyes to see and heavy enough to haul up a strong rope, I did not give up on the idea of a 20-pound line. So my next purchase was a roll of XL in the 20-pound strength. This was too heavy to use in the small Zebco 202, so I bought an Olympic ES-2 skirted-spool, open-face spinning reel. This reel is capable of handling heavier lines, and the side of the spool against which the departing line rubs is tapered so as to lessen the binding mentioned above.

I mounted the reel on PVC tubing inserted in a flagpole bracket, as with the previous reel. With an open-face reel, however, it was necessary to guide the line by means of an eyelet mounted above the reel on the tubing as in the case of a casting rod.

To my disappointment, using the 20-pound XL line with the Olympic reel resulted in a tangled mess on the lawn, in which a cherry tree, the neighbor's dog, and I were temporarily imprisoned. Evidently, even the XL grade was too springy in the 20-pound size.

But I had "one more string to my bow," so to speak. Considering my previous successes with the very limp 20-pound woven-nylon casting line, the next and last step was to try this line with the Olympic reel. Success was achieved, but the results were not as good as with the PBJL launcher.

Conclusions

Results of tests are summarized roughly as follows:

1) The Zebco 202 wound with 8-pound Trilene XL monofilament line gave about 5% greater range than my PBJL with 20-pound woven-nylon casting line.

2) The Olympic ES-2 with the 20-pound woven line was about 15% worse than the PBJL with similar line.

Greatest range and some reliability came with the Zebco 202 closed-face reel filled with old line and then wound with 8-pound Trilene XL. However, the 8-pound line is hard for many people to see and might still be more springy than desired, besides not being as strong as might be desired for hauling a rope over a branch. It appears that the PBJL with 20-pound woven line was the better

choice. However, the Zebco 202 combination is the most portable, whereas the Olympic ES-2 combination is less fragile in transportation than the PBJL and affords faster line retrieval.

As to approximate heights possible, the following was achieved:

1) 28-pound bow and light nylon thread (in 1951): 27 m (90 ft.).

2) 30-pound bow with PBJL and 20-pound woven casting line: 20 m (65 ft.).

3) Portable bow described in the text with PBJL and 20-pound woven line: 9-12 m (30-40 ft.).

Elsewhere, in Oregon, K7MKG has been using a modern compound bow. Jack stated in a QSO that he reaches heights in excess of 30 m (100 ft.) with monofilament line which he says should not be in excess of 10 pounds in rating, agreeing with my observations noted earlier in the text.

In a subsequent letter, Jack wrote: "I might add that I am using a large saltwater open-face reel, a Shakespeare No. 2090. I attach it to a short piece of 1/2" pipe with a hose clamp. I then stick the pipe in the ground with the reel aimed at the treetop. I have little trouble with 8-pound Stren. The large reel is probably an advantage."

Relative to reliability, a follow-up by mail on results obtained by W3MSN[2] revealed that Larry did sometimes experience problems of debris remaining in trees, which illustrates the need for blunt-nosed arrows. Although in five successive Field Day operations ending in 1979, the Boulder Amateur Radio Club archers scored only one loss of an arrow (in an irrigation ditch) and did not decorate any trees with fishing line, still my own occasional bad experiences indicate that skill and caution are needed, even to the extent of having bystanders keep a safe distance in the event that the line from the launcher snags on one end of the bow.

Here it becomes appropriate to quote Henry Wadsworth Longfellow. In "The Arrow and the Song," he wrote:

I shot an arrow into the air.
It fell to earth I knew not where. . .

In today's bedroom communities and even among the Rocky Mountain evergreens of Boulder's public park on Mt. Flagstaff, where Field Days are sometimes held, Longfellow would be considered irresponsible.

Later in the poem, Longfellow told about finding the arrow "long, long afterward in an oak." Luckily, for irresponsible-but-sensitive Longfellow, the recipient was only an oak tree. Another case for blunt-nosed arrows—unless you're out deer hunting—in season, of course.

While wishing you all good luck with your archery, let me once again turn to Joyce Kilmer's poem quoted in the beginning. He described:

A tree that may in summer wear
A nest of robins in her hair.

When we utilize antenna archery, let's not replace that "nest of robins" with a "mess of rope ends," remembering that Kilmer also wrote:

Only God can make a tree. ■

References

1. Richard Silberstein W3JQB, "Some Simple Ways of Erecting Temporary and Semi-Permanent Antennas," *QST*, March, 1952.
2. Larry Briggs W3MSN, "Shooting a Fishing Line over a Tree," "Hints & Kinks," *QST*, April, 1980.

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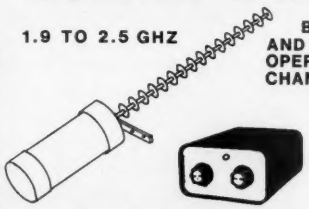

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For those of you who do more than a casual amount of work on your tower and/or beam, control of the beam heading from the tower could be an advantage. Such was the case at my QTH, and it prompted the local-control unit described here for my HAM IV Rotator System (see Fig. 1). Modifications to existing equipment are made in the HAM IV control unit and should not require drilling any holes if you are careful and use your imagination. Access to the individual wires in the rotator-control cable at the base of the tower also will be necessary.

The local-control unit will duplicate all the functions of the remote-control unit except for power control and meter indication. Safety is designed into the circuit so that, when under local control, the remote-control unit has no effect on the rotator. This prevents someone in the shack from inadvertently moving the beam while you are working on it. The local-control unit may be housed in a weatherproof box or stored in a protected location.

Modification of Remote-Control Unit

Fig. 2 shows the schematic of the modified HAM IV control unit. The contacts of relay K1 added to the chassis carry 120 V ac at about 1 Ampere and must be accordingly rated. I used a small surplus unit and wired its DPDT contacts in a double-break configuration. Coil voltage should be rated at 12-24 V dc and less than 100 mA. Appropriate series resistance can be used with a lower voltage coil, but should be avoided because of the higher actuation currents.

To simplify matters, the following procedure is suggested and may save you from chasing wiring around the chassis to determine where connections are most easily made. However, I would suggest that you double-check your wiring to make sure that production variations don't exist between my unit and yours.

- Before starting, pull the power plug! Line voltage is present on several exposed points inside the unit.
- Remove the top and bottom covers by loosening the eight screws in the sides of the unit.
- Mount the relay to the chassis. There are several unused holes in the chassis that could be used, or you can bend up an aluminum bracket.
- Unsolder the heavy transformer-secondary wire from terminal 1 of the terminal strip on the rear apron and connect it to the grounding lug on the chassis just below the terminal strip.
- Disconnect both ends of the short jumper between terminal 1 and ground and discard the jumper.
- Connect a wire from the cathode (banded end) of diode CR1 on the PC board behind the meter to one coil terminal of the relay.
- Connect the other coil terminal to terminal 1 on the rear-apron terminal strip.
- Connect the normally-open relay contacts across the terminals of BRAKE RELEASE microswitch S3. This is the center switch in the three-switch stack near the front panel. Use #18 AWG wire.
- Check all connections, dress the added wires to prevent interference or chafing later, and replace the top and bottom cover sections.

This completes the remote-control-unit modifications.

Construction of Local-Control Unit

Fig. 3 shows details of the local-control unit. If the unit

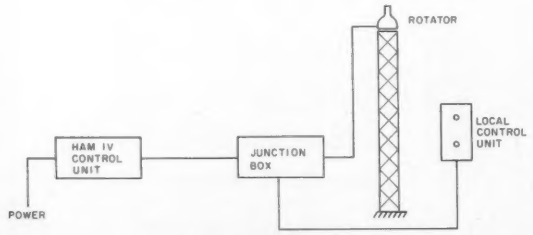

Fig. 1. Beam rotator system showing added local-control unit. Rotator unit on tower requires no modification, nor does cable run up tower.

is to be stored in an unprotected location, a weatherproof enclosure should be used to house the components. Otherwise, a standard minibox can be used. Construction is straightforward, the only precaution being in the selection of the DIRECTION (S2) and SAFETY (S3) switches. These carry the motor current, which is about 2.5 A ac, and should be rated accordingly. BRAKE switch S1 has only to carry the brake-control relay current. Rotary switches for S2 and S3 are not recommended, as they will probably not carry the load.

The indicator lamp shown in Fig. 3 is optional but is recommended to remind you that you have the brake released (energized). The ac voltage across the brake line (terminals 1 and 2 of the rotator) is about 30 V ac. By using the diode in series with the lamp, the voltage is effectively halved to the lamp, thereby reducing the power-rating requirements of the series resistor. Measure the voltage between X and Y on your unit and insert the appropriate resistor. Calculate its value using Ohm's Law and the rated current/voltage specs of the lamp you are using.

One more wire will be needed in the cable out to the junction box at the base of the tower to allow actuation of the brake-control relay in the remote-control unit. If you have spares in the existing cable, fine. If not, lay a length of ordinary zip-cord, field-telephone wire, or even a single strand of #20 AWG along the existing cable run to the junction box near the tower base. The cable run up the tower to the rotator is left as is.

Close inspection of the circuit might suggest that perhaps the extra wire isn't needed after all. By moving the power-transformer secondary from terminal 1 of the control unit to the chassis (where it was electrically connected anyway), we freed up terminal 1 so it could be used to energize the relay from the local-control unit. If our station is prudently wired, then everything will be grounded. Further, if the tower is grounded to the same point as the station ground, then theoretically we could use this ground line as the return circuit for the motor and brake in the rotator, and use terminal 1 on the remote-control unit for relay control—we wouldn't have to add anything to the control cable. *Don't do this!* That ground line is there for safety reasons and must not be used as a current-carrying conductor. Use the circuit shown here and you will retain grounding protection.

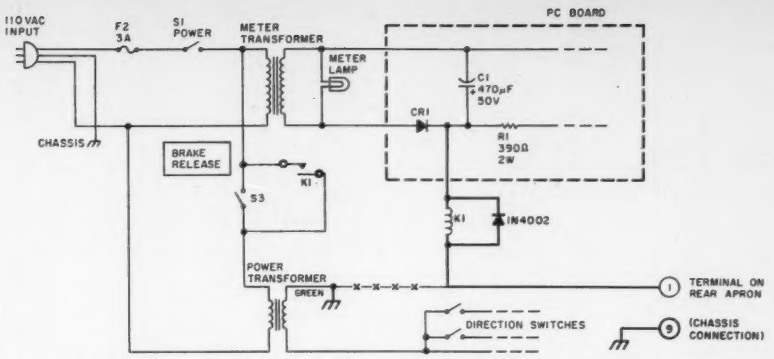

Fig. 2. HAM IV control-unit modification. Heavy lines show circuit changes and added parts. See text for relay information.

Junction-Box Details

I would strongly recommend the use of some sort of junction box (see Fig. 4) to make the connections between the local and remote unit and the rotator. Cut the control cable only after careful examination of junction-box placement and cable run. Locate the box out of the weather if possible. If not, use a weatherproof enclosure. A simple, albeit not elegant, method is to drive a length of 1×4 board in the ground to attach the terminal strip and hang a plastic trash can upside down on the board. There would be room inside for the terminal strip and the local-control unit.

Final Checkout and Operation

Do the following step-by-step checkout procedure to make sure that all connections are correct.

1. Set the local-control-unit switches to the following positions: SAFETY (S3)—Remote, DIRECTION (S2)—Stop, and BRAKE (S1)—Set.

2. Plug in the HAM IV remote-control unit and turn the power switch on. The light in the meter should illuminate and neither the brake nor the motor in the rotator should be energized.

3. Operate the unit and verify normal operation, checking all functions. If there is any difference between the "before" and "after" operation, shut down the unit immediately and check your wiring.

4. Now, leave the power switch on, go out to the tower, and set the SAFETY switch to the Local position. Nothing should happen. This switch disconnects the motor-control lines from the HAM IV control unit to prevent inadvertent operation while you are working on the beam.

5. Move the BRAKE switch to Release. You should hear the brake sole-

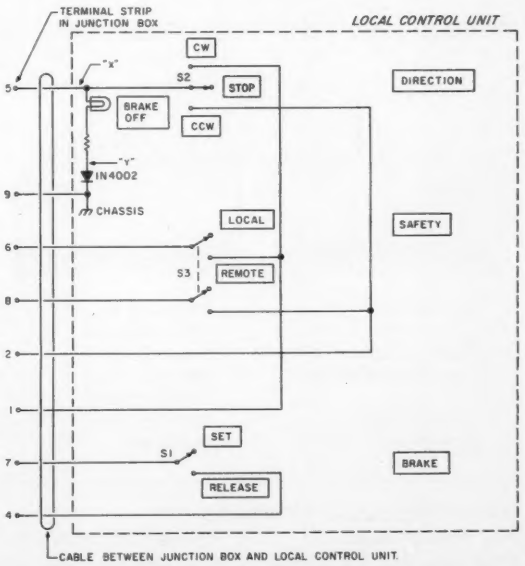

Fig. 3. Local-control unit schematic. See text for explanation of X and Y. See Fig. 4 for conductor sizes in local cable.

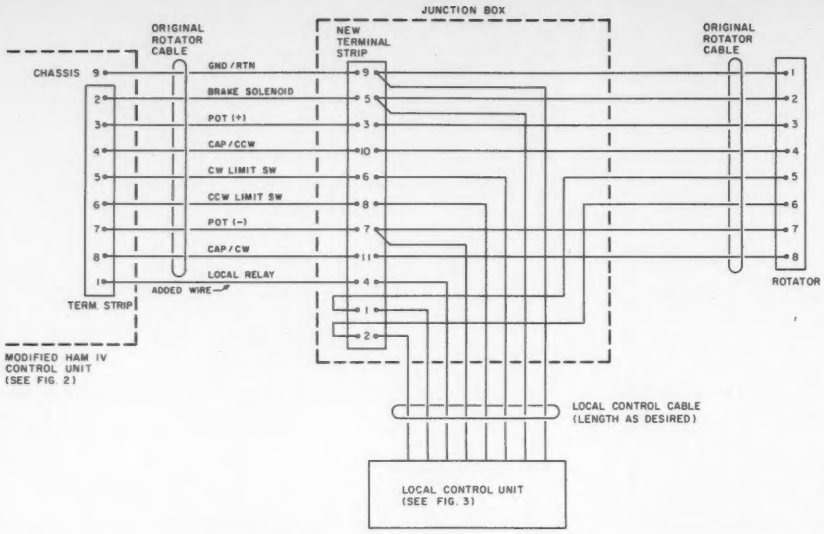

Fig. 4. Junction box and overall cabling. If added local-control cable plus *existing cable lengths total less than 125 feet, use #22 wire in local cable. Use #20 for up to 200 feet total, #18 for up to 300 feet total.*

noid pull in at the rotator and the light on the local-control unit should illuminate.

6. Move the BRAKE switch to Set. The brake should set and the light should go out.

7. Operate the DIRECTION switch. Nothing should happen.

8. Move the BRAKE switch to Release and operate the DIRECTION switch both CW and CCW. The beam should move accordingly. Be very careful as you approach the travel limits—you no longer can see the meter on the remote-control unit. "Jog" the DIRECTION switch when you think you are getting close to a limit to prevent mechanical damage to the beam, rotator, and/or tower.

9. When you are through with the local-control unit, reset the switches to the positions given in step 1, above.

Conclusion

While this convenience may not be desirable to everyone with the HAM IV system, it sure can save you some steps in that special situation. Most antenna rotators operate in a manner similar to the HAM IV, so that the principles shown here can be applied directly to other systems. Remember to check all your connections carefully before energizing for the first time, and be particularly prudent with your ground connections. Grounding systems are for life and equipment protection. Don't cheat! ■

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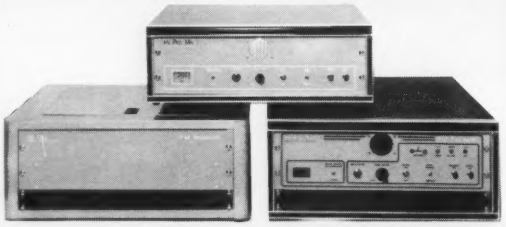

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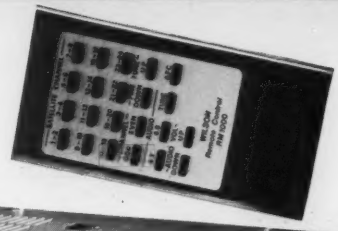

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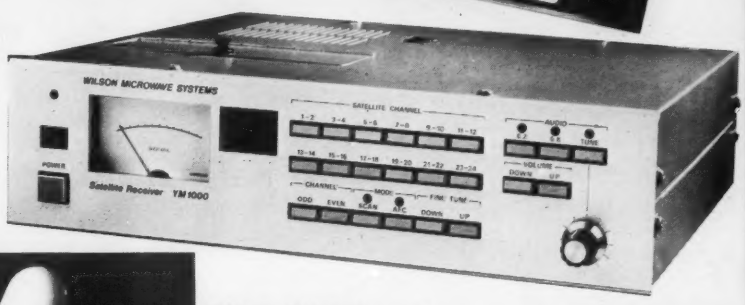

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MD-9 Specifications

ANTENNA

Diameter	8'8"
Construction	12 panels, 18 ga. steel
Finish	Tan, industrial grade
Weight	180 pounds
Wind-operational	50 mph steady load
Survival	100 mph steady load
Temperature range	-60 to +125°
Frequency	3.7 to 4.2 GHz
VSWR	1.1 to 1
Gain	38.5 dB
F/D Ratio	.385
1/2 power beamwidth	1.8°

FRAME

Type	True polar, rotatable base
Construction	1/4" - 3/8" steel
Weight	70 pounds
Finish	Brown
Azimuth Sweep	91°
Elevation	66°

MISCELLANEOUS

Total shipping weight	350 pounds
Warranty	4 year limited

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Thomas Roth
11619 Johnson Drive
Shawnee KS 66203

Put Together the Shawnee Logic Probe

It's better than a tomahawk when you're on the warpath against glitches.

Well, here it is. Another logic-probe project. It's not the simplest, most exotic, or highest-frequency probe you've seen, but it works for me.

This probe indicates a high or low at 70% and 30% of V+ (a CMOS specification, but close enough to TTL switching levels to keep you out of trouble). The circuit in Fig. 1 is very straightforward. One section of the voltage comparator (LM393) senses V in over 70% of supply and the second section senses V in under 30%. These two sections direct-drive the appropriate LEDs. You need to be careful of LED current as the LM393 is rated at only 6-mA sink min/16-mA typical. I've had no trouble with the values shown with supplies of 5-12 V dc. The pulse detector is a CMOS one-shot (MC14538) triggered on the rising edge of the LM393 outputs through 1N4148 diodes. With the RC values shown, it has reliably triggered at greater than 30 kHz on both sine and square waves.

Construction should pose no problem. I've built two sizes of probes so far, one in a Continental Specialist logic-probe case and one in a cigar tube. The resistors are all 5%, ¼ Watt except as noted on the schematic. If you're eyeing a cigar tube, you probably will want to find some miniature capacitors. You may want to add a small electrolytic capacitor across the supply leads (1-2 uF), although I've built it both ways with no apparent operating problems. You may substitute a 2N2222 or similar NPN transistor for the MPSA13.

Operation is very simple. You just clip the supply leads to the circuit under test and probe away. The probe's input impedance is greater than 1 megohm, so you shouldn't load down most circuits. If a test point is between 30% and 70% supply, you will get no LED indication. Any logic changes should give you a pulse indication.

Some things you may want to do to your probe are:

1) Give it a pulse memory; tying the Q output to the set input, a resistive pull-up on the reset input, and SPST switch to GRD for reset should work.

2) If you're really worried about overvoltage, you can put a 15-18-volt zener across the supply line.

3) If you need to know the polarity of the detected edge, you can wire in the second half of the 4538, eliminate the diodes, and connect the two inputs to the LM393 outputs, adding a second resistor/transistor/LED.

I hope you find this as useful as I have and get it working the first time around. ■

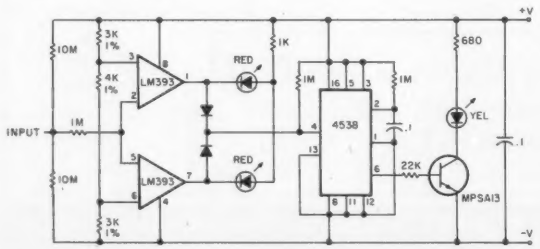
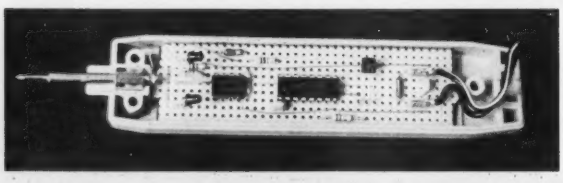


Fig. 1. Schematic. Resistors in Ohms, capacitors in uF. Diodes—1N4148, 1N4154, etc.



The logic probe.

Parts List

Qty	Item	Cost
2	1N4148 (1N914, 1N4148, etc.)	$.20
2	T1 LED (red)	2.00
1	T1 LED (yellow)	1.00
1	LM393 dual comparator	1.50
1	MC14538 dual one-shot	1.20
1	MPSA13 NPN transistor	.60
2	0.1 uF capacitor	.75
1	1.0 to 10.0 uF electrolytic (alum./tant.)(opt.)	.50
2	3k 1% resistor (hand-picked 5%)	.50
1	4k 1% resistor (hand-picked 5%)	.25
3	1 megohm 5% resistor	.30
2	10 megohm 5% resistor	.20
1	1k 5% resistor	.10
1	680 5%	.10
	Misc. hardware, PC board, case, etc.	10.00
		$19.20

Notes: (1) Resistors 1/4 W (1% may be 1/8 W). (2) MC14538 may be replaced by MC14528. It is pin-for-pin compatible but the RC values will be different (see 14528 data sheet). (3) T1 3/4 LEDs may be substituted if they meet the current tolerances of the LM393. (4) LM393 may be replaced by a quad comparator (LM139/239/339, LM2909, LM3302).

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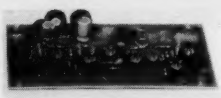

TXA5-4 Exciter/Modulator . ~~$69~~ . $85.00 ppd.
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Stripline MRF 901 preamp and double balanced mixer digs out the weak ones and resists intermod and overload. Connects between UHF antenna and TV set. Output channels 2 or 3. Varicap tuner 420 to 450 MHz. Requires 12 to 18 VDC @ 20 ma.
Extrasensitive TVC 2L with NE64535 preamp (.9 dB NF) . . . . . ~~$65~~ . . . . . $59.00 ppd.
Supersensitive TVC 2G with GaAs Fet preamp (.5 dB NF) ant. mount . . . . . $79.00 ppd.

FMA5 Audio Subcarrier Generator . $29.00 ppd.
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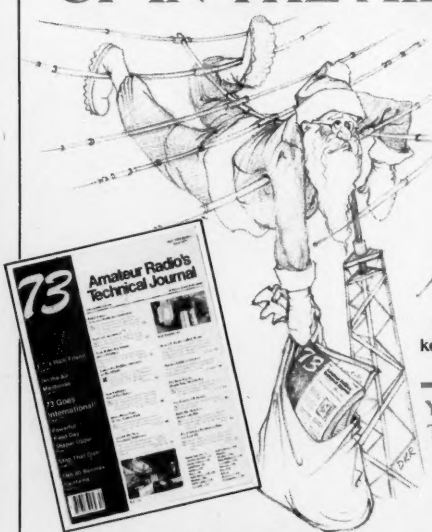

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77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
82.5 YZ	107.2 1B	141.3 4A	186.2 7Z
85.4 YA	110.9 2Z	146.2 4B	192.8 7A
88.5 YB	114.8 2A	151.4 5Z	203.5 M1

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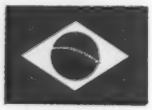
73 INTERNATIONAL

Each month, 73 brings you amateur radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Avery L. Jenkins WB8JLG.*



BRAZIL

Carlos Vianna Carneiro PY1CC
Rua Afonso Pena 49, Apt. 701
20270 Rio de Janeiro, RJ, Brazil

BRAZILIAN TIIC-1 TRANSCEIVER

Manufactured by the Intraco Co., this all-solid-state, 100-W-output, Brazilian transceiver is the most up-to-date electronic jewel offered to Brazilian amateur-radio operators.

It works on all bands from 10 to 80 meters, including the new 12-, 17-, and 30-meter bands. It also comes with a 12-V-dc power supply and a 110/120-V-ac unit and has a peak power consumption of 250 W. The TIIC-1 can be used as a base or mobile station.

The frequency range is as follows: 3.5–4.0 MHz; 7.0–7.5 MHz; 10.1–10.15 MHz; 14.0–14.5 MHz; 18.068–18.168 MHz; 21.0–21.5 MHz; 24.89–24.99 MHz; and 28.0–29.7 MHz.

Transmitter carrier suppression is better than 40 dB and unwanted sideband suppression is better than 50 dB, while harmonics and signal attenuation is better than 40 dB. Intermodulation distortion is 25 dB down and frequency stability is ± 500 Hz after 30 minutes. The output impedance is 50 Ohms.

The receiver's image rejection is better than 60 dB, and i-f rejection is rated at 50 dB. Selectivity is 2.7 kHz for 6 dB and 5.6 kHz for 60 dB. Audio output power is 3 W with less than 10 percent distortion.

The TIIC-1 is a very nice and distinct rig—a sure bet for love at first sight. Its dimensions are 32 cm × 11 cm × 34 cm deep, and it weighs 8 kg. If it is used mobile, the rig has only a 16-A peak transmitting current.

This rig is almost 100 percent Brazilian—only 5 percent of it is imported—and it is being exported to Colombia and Chile, and possibly to Argentina, Peru, and Ecuador. It costs only $590 US for both the power supply and the transceiver.

Intraco is also introducing an external vfo and wattmeter. These products join the lineup of Brazilian ham gear which includes the RT-1 antenna rotor with a speed of 6 degrees per second.

Considering the Brazilian government's goal of 100,000 amateur-radio operators in the near future, the TIIC-1 and Intraco will be a big help to this program. The 100-W output matches the limits for beginning hams and many older hams will be interested in it as well.

For more information, contact Mr. Jean Weiner, Trade Director, Telecomunicacoes Intraco Ind. Com. Ltda., rua Costa Aguiar 1279, 04204, Sao Paulo, SP, Brazil.

ECUADOR

B. Patricio Recalde S. HC2PP
PO Box 511
Guayaquil, Ecuador

The Guayaquil Radio Club is the oldest club in Ecuador. It was founded on May 9, 1923, by Ignacio Wolf, who was also its first president.

Our anniversary meeting was held last May, with a party and a nice session, the same day as the founding of the club. In this session, diplomas were given to members who have been radio amateurs for more than 30 years. The club also received congratulations in special speeches by civil-defense officials, government officials, and Boy Scout leaders, praising our assistance in emergencies (of which we have had too many).

With this short article, we begin a series that will let you know all of the emergencies that we are handling every month or so. But first I will talk about our meeting place.

It is a beautiful building, three stories tall. The first floor is for administration purposes and in here we have an office with two-meter equipment and a secretary. The office of the club president is also on this floor.

The second floor is where the general assembly hall is located. Although we have many members, this place is large enough to accommodate all of the people who come to our annual meetings.

The third floor is where the action is. We have a radio shack with more than ten pieces of equipment so we can transmit on different bands at the same time.

There is a room for storage, temperature and humidity controlled, in which we keep all of the radio equipment and accessories that we need. We have 25 TR-2500s, 7 HF rigs, 6 TR-7850s, antennas for the different bands, batteries, scanners, power supplies, etc.

On this floor is also the room where the weekly meetings of the members of the Directory are held.

We have three towers. Two of them have nothing but Telrex monobanders for each HF band. The other tower is the tallest (105 feet high) and supports all of the VHF antennas. In the two-meter band we have the capability of transmitting in simplex, without the help of repeaters, for 200 kilometers. This range varies somewhat with the weather and other factors.

Since we are members of the IARU, we will give information related to it, too. There was a meeting recently in Cali-Colombia, where HC2NW represented the 2730 members in our country. If you plan to come to Ecuador, please let us know so that we can make your stay more comfortable through the hospitality of amateur radio.

FRANCE

Claude Guse F1DGY
11 Rue Emile Labiche
28100 Dreux, France

Each year since 1976, club station F1KJC has organized a hamfest at the end of June. This club belongs to a French color CRT factory (Philips-RTC) located in Dreux.

Dreux is a small town of 40,000 inhabitants located 50 miles southwest of Paris, on the borderline of Normandie and Ile-de-France. There are few hams in this town, so the majority of the participants come from the surrounding countryside.

As far as weather is concerned, June is generally sunny—important for a picnic.

Mobile operators are guided to the picnic area on 145.525 MHz. The access is not very easy...a simple beaten path leads to the site, and you have to beware of tree limbs which will snag your antenna.

At noon, it is time to light the barbecues for the "merguez" (spiced sausage) and it is also time for a drink, of course. The next hour is spent chatting with one another. After the last merguez and the last drink, the camping equipment is put under the trees. Then coffee is served, to fortify those who would rather nap than try to find the fox.

This year, two beacons (200 mW, 144.700 MHz) were hidden in the woods 2–3 miles apart. The winner of this eighth fox hunt was Daniel F6AJJ and his buddy William F6DLA. Daniel has won the hunt before, in 1979 and 1982, so he got to keep the club cup for 1983.

Thanks to all of the participants at this hamfest for their very nice spirit. Now we have to begin thinking of the next one!

5TH PHILIPS QSO PARTY

French Philips employees and employees of its affiliate companies have organized this year's QSO Party. Each ham who belongs to this group worldwide is welcome to participate. Rules can be obtained from the country coordinator or from Eric Ludwig F9LT, 9 Rue de la Broaderie, 78340 Clayes Sous Bois, France.

The HF CW contest will be held Nov. 5–6, and the HF SSB portion will be on Nov. 12–13. HF RTTY and SSTV entrants will be competing Nov. 5–13, and the VHF/UHF contest was held Sept. 17–18.

GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire, England

By the time you read this, you will probably have heard some new prefixes from the UK. On the HF bands, G0 calls will be active, whilst G1 calls will be on VHF (and may be heard in the US via satellite, of course).

It occurs to me, therefore, that an explanation of the UK callsign allocation system would be of help. Even without considering special-event callsigns or experimental licenses, the UK contributes no less than 56 prefixes to the WPX program!

UK callsigns are divided into three main parts: the country designator, the operator identifier, and the optional suffix. The most important of these items is the operator identifier and so I will deal with this first. It consists of a figure and two or three letters. In my case, the operator identifier is 4EJA and this, like all others, is unique (but there could be a 3EJA or an 8EJA, etc.).

The figure indicates the class of license held, this being either class A or class B. A class-A licensee may use all bands and all modes and has passed a written test and a 12-wpm code test. A class-B licensee may use only the VHF bands (144 MHz and above—note the exclusion of 50 MHz and the Region One allocation at 70 MHz) and any mode except CW. A class-B license is obtained by passing only the written test.

The prefix number (in conjunction with the number of letters in some cases) indicates the license class:

Number	Letters	Class
0	all	A
1	all	B
2	all	A
3	all	A
4	all	A
5	all	reciprocal
6	two	A
6	three	B
8	two	A
8	three	B

(Note that 7 and 9 are reserved for a few special experimental licenses.)

Preceding the figure is the country identifier. In my case, my station is licensed in England, so I use G. However, if I drive down to the Principality of Wales (which I can do in about 40 minutes), I must change the prefix to GW.

The country prefix therefore indicates the location from which the station is operating rather than in which it is licensed; if I travel to Scotland, I become GM4EJA. The full range of UK country prefixes is: G—England, GM—Scotland, GI—N. Ireland, GW—Wales, GD—Isle of Man, GJ—Jersey, and GU—Guernsey.

As well as a possible change in country prefix, the traveling ham will almost certainly have to use a suffix. Operating from my car in Wales, which I do occasionally with an FT-290 and a 30-Watt linear, I sign GW4EJA/M—the suffix indicating mobile.

If I walk into the mountains with my IC-2E handie-talkie (admittedly not very likely), I sign GW4EJA/P—this time the suffix indicating portable.

If I set up a semi-permanent (i.e., mains-powered) station in my trailer near Appleby in the English Lake District, I sign G4EJA/A—this indicating an alternative address.

Finally, I must mention GB prefixes which indicate special-event stations (usually at fairs or fetes, etc.) and which may be operating from any counfry in the Kingdom, as may beacons and repeaters which also use the GB prefix.

GREECE

Manos Darkadakis SV1IW
Box 3751
Athens, Greece

As in every country, Greek radio ama-

teurs have their preferences about which bands they enjoy working. There are HFers and VHFers, and others who prefer to spread their activities over all bands if possible, or in all modes. Of course, I left the most important thing until the end, and that is our wallets. You may want to do a lot, but...

Anyway, back in my first days of hamming, HF was what everyone was using. Many people had home-brew rigs, some had Heathkit or Yaesu gear, and the elite used Collins equipment.

Outside of the HF bands, a few people with Twoers were exploring the challenge and mystery of VHF. But the revolution in the electronics industry did not miss Greece. In my country, this started in 1978, but it was not only the competition between manufacturers—it also stemmed from competition among hams.

Those days, and for quite some time afterward, to be a respectable ham in Greece (and other places, too, I believe), you had to have a couple of HF rigs, two or three VHF radios (base, mobile, and portable), one or two UHF transceivers, and, of course, a RTTY or SSTV terminal—just to name a few.

The antenna was the last thing under consideration. Even today, can you imagine a $2000 FT-ONE on a CB antenna modified for 10 meters? Well, I can.

It is really amazing to see what has happened in Greece in the last two or three years. We can buy Yaesu and Icom gear even before it is advertised in England or the US. Therefore, most of the HF rigs in Greece today are Icom (720s, 730s, and 740s) and Yaesu (FT-ONEs, 707s, 102s, and 980s). There is also Drake and Kenwood gear, and even some fancy rigs like the Collins KW-380. Palomar's state-of-the-art rig was available some years ago.

Nowadays, there are a lot of SV hams active on HF bands, but only a few of them are active DXers. About 80 percent of all hams in Greece have 2-meter rigs and 60 percent of those have an all-mode transceiver. 20 percent are active on UHF as well, again with all-mode rigs. Finally, five or six hams are active on the SHF hands.

Of course, SSB and FM are the most popular modes on most bands, with CW a distant third. In the specialty modes, about fifteen people are working RTTY and there is a handful of slow- and fast-scan TV and satellite operators.

In closing the column this month, I will mention the existing repeaters in Greece, with more information to come soon.

On VHF, we have R1 situated in Athens, R3 in Heraklion on the island of Crete, R5 in Volos in the central part of Greece, R6 in Thessalonika, and finally R8 on the island of Lefkas in the Ionian Sea. There is also a UHF repeater, RU1 in Athens and a UHF transponder linking the R6 VHF repeater with RU6 frequencies on UHF.

All repeater frequencies are established according to the IARU Region 1 band plan, with the input −600 kHz on VHF and −1.6 MHz on UHF. None of them has tone access.

INDIA

James Kalassery VU2ARL
PO Box 1446
36/677 Monastery Road
Cochin 682011
India

1983 is a remarkably good year for amateur radio in India. Thanks to our government and the Federation of Amateur Radio Societies of India (FARSI), we now have a few WARC bands and more privileges—more power for the Advanced class, more modes for Grade I, and more bands for the Grade II licensees.

The Wireless Planning and Coordination (WPC) Wing of the Ministry of Communications, which regulates amateur radio in India, has recently released two WARC bands—18 MHz and 24 MHz—for use by radio amateurs on a non-protective, non-interference basis. With this gesture, India is now placed among the few countries which have permitted their amateurs to operate on these new bands. After our government allowed the importation of amateur-radio equipment and accessories under the Open General License of Import Policy, many amateurs bought equipment which enabled them to start operation as soon as the new bands were released. We hope these new bands will open up new vistas of activities in the fields of operation and research for improved peripherals.

Now, Advanced-class amateurs can run up to 400 Watts (as opposed to 150 Watts previously) input on selected portions of the HF bands. Grade-I amateurs can work on all modes, some of which (SSTV, RTTY, etc.) were previously reserved for the Advanced class. Grade-II amateurs, who were allowed to operate only CW on 80 and 40 meters and phone on 2 meters, now can operate CW on all HF bands and phone on 10 and 2 meters. Their power also has been raised from 25 Watts to 50 Watts dc input.

Our government is now keen on promoting this unique hobby. While previously we had to obtain express permission from WPC to move stations even for demonstrations, etc., now we just have to intimate them in advance. Testing Morse code for the licensing examination also has been made simpler, though the speed standards are the same as before. The requirement of copying continously for five minutes with a maximum of five mistakes has been relaxed to copying correctly for any one minute (out of the 5 minutes) continuously.

These relaxations, announced during this World Communications Year, have come as a result of a meeting the representatives of our radio amateurs had with the Wireless Advisor last December. With more changes expected to be announced shortly, amateur radio certainly has a bright future in India.

ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev Mobile Post Office
85530 Israel

As I write these lines, the reverberations from the 35th annual General Assembly of the Israel Amateur Radio Club are still echoing in my mind. So, for this month's column, I would like to give you an account of the proceedings.

The meeting was opened by the chairman, Yankele 4X4AH, telling us that he believes that hams are a group of individuals wishing to enjoy their hobby with a minimum of interference from neighbors and authorities. With this in mind, he made a plea for unity, urging us to remember above all the purpose of our organization.

Naftaly Balaban 4Z4RM, the outgoing president, surveyed the past year's goals and achievements. He then went on to the presentation of awards and trophies for achievements in national competitions and to outstanding amateurs and clubs.

Alon Tavor 4Z4ZB was named amateur of the year in recognition of his devoted work at the Alyn Hospital for Handicapped Children in Jerusalem. He established there club station 4Z4SW and conducts classes and on-the-air sessions for the children who are largely confined to wheelchairs. Alon invites amateurs visiting Jerusalem to drop in on the club.

Ron Roden G4GKO was presented with honorary life membership in the IARC in appreciation of his representing us over the past years at meetings of the IARU. Ron, deeply moved, said it was his privilege to represent Israel, and he would continue to do so as long as needed. I must point out that the IARC, being a relatively small organization, has never been able to support sending a delegate to international conferences, and Ron, whose work takes him around the world, is happy to represent us. Ron spoke of the aims of the IARU in these days of crowded bands and said that in next year's meeting in Sicily, the organization will deal with band planning and try to set aside frequencies to be free from competitions.

Speaking for the Ministry of Communications, Israel Biber 4X4OR spoke of the problem of self-discipline in the amateur ranks. He said that the Ministry intervenes when "the waters run over" (translation mine) and that it was forced to take action against a few illegal operations this past year. These actions are most brutal, as the police make little distinction between illegally holding arms or transmitting equipment. Mr. Biber pointed out that there are currently 80,000 radio transmitters licensed in Israel, largely on VHF, averaging 200 stations per channel, all casting hungry looks at our wide spectrum allocations. Thusly he exhorted us to keep our frequencies clean and preserve our rights.

After these presentations, a free discussion was held that, due to the late hour, was limited by time. A past treasurer, Tuvia 4X4GT hauled up to the podium an empty satchel. This bag, he said, could contain a hundred thousand shekels (roughly $2,000) for the club treasury, had a raffle of equipment been held, as was done in previous years. Ben 4Z4JS suggested that next year a raffle of only a few good pieces of equipment be held, instead of the time-consuming draw of scores of pieces of junk.

A slate of candidates for the new club executive was proposed by Aharon 4X4AT, and with no opposing candidates proposed, the list was unanimously accepted. The new officers are as follows: 4X4s AT, JT, GT, and NOE; 4Z4s NU, RZ, UR, US, and NUT; 4X6s DW, LM, and NFK. This is, to my mind, an excellent group of active and involved amateurs who have all pledged to give the most of themselves for the good of our national organization. This strongly contrasts the situation at last year's general meeting when arms had to be twisted to get people to agree to be nominated. This was reflected in much of the activity of last year's executive, and it looks like this year people were shaken out of their apathy and have come forward to give us a stronger club.

At 11:30 pm, the management began flashing the lights of the auditorium, signaling us that our time was up. For the next hour and a half, the 2-meter repeaters and simplex channels were buzzing as a few hundred hams made their way back from Jerusalem to Tel Aviv on the Mediterranean coast, to Beersheva and the Negev in the south, and to Haifa and Galilee in the north. Once again, the yearly rites of the IARC General Assembly had come to an end.

ITALY

Dr. Giancarlo Martelli I8XXR
18, Via Bevignani
00162 Roma, Italy

VATICAN CITY

For many hams, the HV prefix is still an elusive and rare one. Here is some late information about the stations active from Vatican City.

HV3SJ

This station is located in the Jesuit Headquarters Building, just a quarter of a mile from St. Peter's Square. The building is outside the Vatican State border, but being property of the Vatican itself, is considered extraterritorial by the Italian state, by virtue of the agreement between Italy and the Vatican. This station is active almost exclusively during the weekends and is operated by Pino D'Aurelio I8DUD, who prefers SSB. Father Larry, a CW enthusiast, also uses the station.

The HV3SJ facilities are a Collins S-Line and a three-band, two-element, cubical-quad antenna. No low-frequency antennas are set up there. The QSL traffic is managed by I8DUD at his home address: Giuseppe D'Aurelio, Via Fogazzaro 87, 00137 Roma, Italy.

HV1CN

The station is housed in a small room in the same building as the studios of Radio Vaticana, together with the VHF/FM broadcasting station.

The medium-wave and shortwave transmitters of Radio Vaticana are located at S. Maria Galeria, a locality 25 km from Rome, where the huge display of towers and curtains is the dream of any ham who passes by. An auxiliary 25-kW shortwave transmitter is located a few hundred feet from the HV1CN shack and radiates its power through a log-periodic rotary antenna.

The combination of HF and VHF waves fills the air at HV1CN, so heavy IMD and overloading occurs very often in the receivers of the ham station.

The equipment is a slightly-outdated Hallicrafters line, but its tube-equipped front end beautifully resists the attacks from the nearby broadcasting transmitters. The antenna is a TH6 beam for 10, 15, and 20 meters. No LF antennas are here, either.

The chief operator of HV1CN is Domenico Petti, the chief engineer of the broadcasting station; very often, he welcomes guest operators.

The station is not very active due to the fact that Domenico is an employee of the Radio Vaticana and lives in Rome, outside the Vatican borders, so he is very busy with his job when he is in the building.

QSL cards should be sent to HV1CN, c/o Vatican Post Office, Citta del Vaticano, Rome, Italy. Be careful not to send QSL cards for HV1CN through the bureau, because the only bureau in Italy is the ARI bureau, which has no connections with the Vatican.

HV2VO

This station is located in the Vatican Observatory of Castel Gandolfo. The building is a big, ancient castle which houses the summer residence of the Pope

and holds extraterritorial status. Castel Gandolfo is a small city about 20 miles from Rome.

The HV2VO station is operated by Father Edmund Benedetti, only on SSB. The antenna farm has a three-element beam for 10, 15, and 20 meters and inverted-V antennas for 40 and 80 meters. Since the Vatican Observatory building is on top of a hill, the location seems to be very good for radiating signals, and the HV2VO signal is very consistent around the world.

This station is fairly active when Father Edmund is not traveling abroad and offers the only chance to work the HV prefix on the 40- and 80-meter bands.

The QSL manager of this station is Giancarlo Gottnich I9GPY, Via Vigne Morena, 90-00040 Roma Ciampino, Italy.

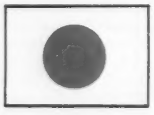
THE ARI DOCTORS AND RADIO AMATEURS GROUP

This group of radio-amateur hams was founded five years ago, and since then it has grown and achieved much acclaim for its emergency and welfare activities related to amateur radio. The group is working inside the ARI (Associazione Radioamatori Italiani) and is connected with the ARI CER (Corpo Emergenza Radioamatori).

Every year, the group's members meet in Foligno, a fascinating town located in Umbria, central Italy. There they discuss their activities with regard to radio telemetry and the transmission of medical parameters via amateur radio—things like electrocardiograms, radiographs, etc.

Some members of the group have recently been to China, where they gave demonstrations of the experimental work done through amateur radio. The Chinese Sports Ministry hosted these MD hams and invited them for another trip to China—this time with their ham equipment.

The group holds its net daily on 40 and 80 meters, so medical aid over the air is available in every emergency.



JAPAN

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ILLEGAL OPERATORS IN JAPAN? AMERICANS NOT ALLOWED TO QSO WITH AMERICANS?

Judging from the title of this month's column, one would get the impression that things are a little screwed up in Japan as far as ham radio is concerned. They are! Let's review the situation in brief, as those of you who may have tuned in late, that is, those of you who have not read the previous months' columns, may be a little confused. Shame on you.

As of this writing, Japan has no reciprocal licensing agreement with any country. A law was passed by the Japanese government in May, 1981, that ostensibly permits the signing of reciprocal agreements with other countries. The Japanese have privately stated that their goal is to sign the first agreement with America. The other countries can wait. The Japanese government made their proposal to the US government, but it was wisely rejected by the US because it contained certain objectionable provisions, such as station inspection, the necessity of permission from the owner of the premises where the station would be located, and a rip-off license fee.

While this is being written, the two governments are squabbling over these and other points. It is possible (but unlikely) that by the time you read this, the problems will have been resolved and that the first reciprocal agreement with Japan will have been signed. I wouldn't bet very much money on it, though.

However, American and German operators can operate in Japan by using a club station callsign and have been doing so since 1970. This was brought about by former US Ambassador to Japan, Armin H. Meyer W3ACE, who persuaded the Japanese authorities to make a minor change in the law. Under this system, most foreign operators run only 10 Watts, as higher power would require an inspection, requiring a 6-month or longer wait, plus an inspection fee. Note that the Japanese government does not issue callsigns to non-Japanese amateurs. Operators' permits only are given to foreigners who hold a valid FCC or German amateur license. The callsign must be in the form of a Japanese club callsign which is "lent" to the foreign operator.

Finnish and Irish hams also have been given this same privilege during the past two years.

And that's how things stand at present: Only amateurs from America, Germany, Finland, and Ireland can operate a club station in Japan.

ANOTHER WAY TO GET ON THE AIR IN JAPAN...

There is still one other way to get on the air in Japan. If you can read, write, and understand Japanese, you have the unique opportunity to take the Japanese-language amateur-radio exam. If you pass it, you will receive a lifetime Japanese operator's permit. But note that this still does not get you a callsign. Remember that under present regulations, callsigns are given only to Japanese citizens. So you still have to find a club station to operate. Several hams have done it. We believe that the first person to take and pass the Japanese exam was Norman Smith G3HFO, who was a member of the British Embassy. That was in 1970. Norman enjoyed operating a Japanese club station for several years. In more recent times, Keith Wilkinson ZL2BJR also obtained his operator's permit this way. It should be noted here that the JARL runs training courses designed to ensure that you pass the test. The test itself is a multiple-choice type. So, as you can see, although it is not impossible to do, and even though Japanese is not a difficult language to learn to speak, learning to read and write it takes some real effort.

AND STILL ANOTHER WAY...

There is one more way to get on the air in Japan. This is not necessarily the recommended way, and as a matter of fact, the only person to try was only marginally successful. Here is the way it works: It is said that from a legal standpoint, an embassy or consulate located in a foreign country is not really on foreign soil at all. In other words, the argument goes, the British Embassy that overlooks the Imperial Palace grounds (there's where the Emperor and Empress of Japan live) in central Tokyo is really British territory. Looks can be deceiving. Mr. John Donald G4JFM, who lives and works in the British Embassy here in...uh...Tokyo (or I should say in the British Embassy on British soil somehow transplanted to the center of Tokyo), realized this fact and went to the British Ambassador to get his opinion. The Ambassador said, in effect, "John, you're on British soil! Go on the air. I'll back you up." So, in February of this year, John went on the air, signing G4JFM/JA. John had a lot of contacts with stations all over the world, including QSOs with friends back in his home country.

He also received a lot of on-the-air threats from Japanese hams who asked a lot of questions. John answered them all honestly. The threats continued, ranging from the classical but unoriginal type of "I'm going to report you to the Ministry of Posts" to the more original type of "Get off the air, white pig!" This from our nice, gentle Japanese ham neighbors who can go to the United States, take the test, and obtain their own genuine US ham callsign. In fact, many Japanese hams are doing this as part of their collection, much the same as one goes overseas and brings back an ashtray or other souvenir (mostly made in Japan). Furthermore, Japanese hams can now go to the UK and obtain a permit to operate, even though no reciprocal agreement exists between Japan and that country. In fact, John worked a Japanese amateur operating from Britain. But some people are not persuaded by those arguments.

The slurs, threats, and especially the jamming got so bad that John finally gave up—temporarily, at least. Now you would think that in a democracy, as Japan is purported to be, the citizenry would understand that it is the exclusive duty of the government to decide if a law is broken and take whatever action is required. For a citizen to take it upon himself to interpret the law and censor another person without due process of law reminds one of the lynch mobs that once pervaded the western part of the US many years ago.

John has a good view at least. He is able to sit at his operating table and gaze from the shack-room window upon the beautiful Imperial Palace grounds on the opposite side of the street beyond the moat (no crocodiles or alligators in the moat) while he sips his tea. English tea.

NO OTHER WAY...

Some ham-radio operators who come to Japan do not have these options open to them. For instance, Rossella Strom I1RYS is not American, German, Irish, or Finnish. She is Italian and therefore she can't go on the air under the club-station system. She is not fluent in Japanese either, not having been in Japan very long, so she couldn't very well take the Japanese exam. And she is neither working nor living in the embassy of a foreign government. She is an attorney, although her reason for coming to Japan was to accompany her businessman husband. So for her, there is no way to get on the air in Japan. She can't even speak over the microphone of a Japanese friend's station, as that is prohibited in Japan. Only a holder of a valid Japanese operator's permit can do that. She will have to wait for a reciprocal agreement. Incidentally, she wasn't allowed to practice law in Japan either. That's prohibited, too! Last week she solved her problems in one fell swoop. She and her husband moved back to Italy.

AMERICANS NOT ALLOWED TO SPEAK TO OTHER AMERICANS!

As an American living overseas, it's sometimes nice to have a "local" QSO with another American living in Japan. Having QSOs with Japanese and other hams is always fun, but nothing beats having a QSO with a fellow American. No harm there, right? Well, it "ain't necessarily so" says the Japanese government.

Some of you may remember that there was once a war called World War II that ended in Japan's defeat in 1945. Allied occupation forces came into the country at that time, and the hams among the occupation forces were given permission to operate ham radio from Japan. When the peace treaty was signed in 1952, the US troops were no longer "occupation forces" but instead came under the agreement called the Status of Forces Agreement, or SOFA. Under SOFA, the military was given certain rights to establish communications as they saw fit. Under this authority, the US obtained a block of callsigns from the FCC to use for US hams stationed in Japan under SOFA. The FCC does not license these American military hams for Japanese operation, as they already possess FCC licenses. The licensing authority for operating in Japan is the American military command in Japan. The callsign prefix is KA, with various numbers following that which identify the region within Japan, followed by two letters.

The situation was going quite well until September, 1959, when, it is reported, a Japanese ham who apparently disliked American GI hams operating in Japan (in spite of the fact that we gave them their country back after fighting a vicious war) challenged the Ministry of Posts to define the legal status of these hams. Note that they were operating on military bases only. The military authorities prohibit KA operation off the base, thereby recognizing the sovereignty of the Japanese government to control ham-radio operation on pure Japanese soil. It's interesting that the US government considered and still considers US bases not to be on Japanese soil, for the most part. Sounds familiar, doesn't it? Anyway, the ministry buckled under and ordered, through the JARL, Japanese hams not to have QSOs with US military stations or face license revocation. The US military also ordered its KA stations not to have QSOs with Japanese hams so as not to aggravate the situation.

Now we move up to 1971, when a lot of American civilian types living in Japan, assigned to Japan on business or teaching positions, began to obtain Japanese club-station callsigns. This often resulted in some interesting exchanges. Sergeant John Smith KA2SS is located on a US Air Force base 30 miles west of Tokyo and operates from his on-base quarters. Roy Waite JA1YSH is a businessman and operates from his condominium in Tokyo:

KA2SS: "CQ, CQ, CQ. This is KA2SS calling CQ and standing by."

JA1YSH: "KA2SS. Calling KA2SS. This is JA1YSH calling KA2SS and standing by."

KA2SS: "Sorry, old man; I can't QSO with you. Are you an American using a Japanese callsign? Over."

JA1YSH: "Yes, I am. I am operating a Japanese club station. By your call I thought you were on the west coast of the US. Too bad we can't QSO. Do you get to Tokyo sometimes? Over."

KA2SS: "Sure do. Let me have your phone number and I'll contact you next time I come to town. By the way, you're 5 and 9 out here. The handle is John. Over."

JA1YSH: "OK, John. The handle is Roy. You're 5 and 9, too. Yes, I'll give you my telephone number. Too bad we can't QSO..."

Sounds a little silly, doesn't it? If you think that's funny, you should hear the SEANET (South East Asia Net) when a Japanese takes over as the net controller. During the roll call, whenever he comes to the KA stations, he has to turn over the controller job to a non-Japanese station, such as a Hong Kong station, to call in the KA stations. When that's finished, the Japanese net controller resumes the roll

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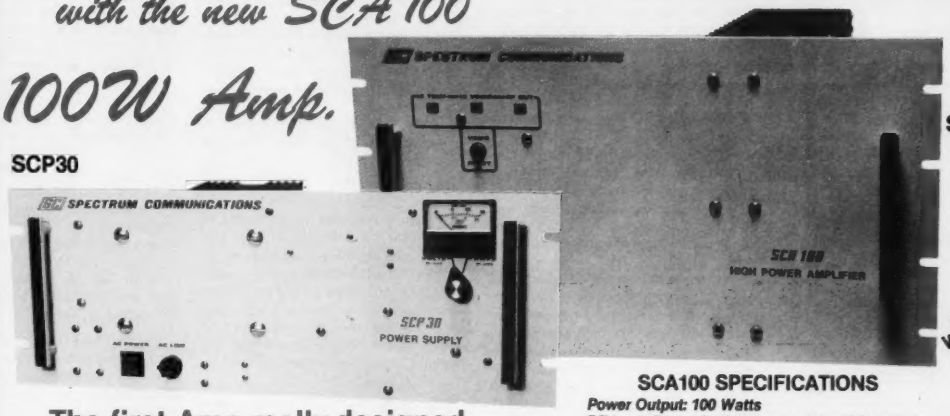

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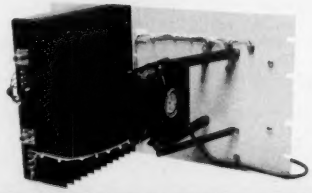

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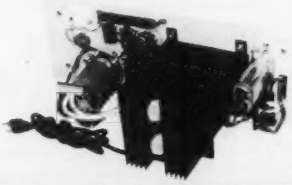

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call for the rest of the stations. As you can see, the rest of the world recognizes the US military ham stations in Japan as legitimate hams, while Japan does not.

For a time, there were some US military civilian workers who were operating on both sides of the fence. That is, they used a KA station while on the base, and at night at home, they used a Japanese club station. This went on for a few years, until the Ministry of Posts realized what was happening. The Ministry of Posts has committed a number of mistakes and contradicted itself several times, such as allowing one thing one time and disallowing it later. The operating word here is "inept."

I said earlier in this article that ham radio is a little screwed up in Japan. After thinking it over, I'd like to retract that comment. It's more than a little.

LIBERIA

Mark H. Monson M.D. EL5G/KB8NO
Box 1046
Monrovia, Liberia

POLE PIG REVISITED

So you have always wondered what we do in West Africa when we take diagonal cutters in hand and go outside to do a little antenna work, right? Well, it is much the same as you might imagine they do it in Florida, i.e., cut, sweat, trim, and measure the swr, over and over again. However, we do it more often than you do it.

Not that we aren't so good at cutting, sweating, trimming, and measuring the swr, but there are a few other factors that you must consider. You can't just pick up the telephone and have a nice antenna at your doorstep in less than a week, even if you have the money. So if you want a beam, you end up with a quad. Quads are a dream here, supposedly high gain with short booms on low towers, lots of free bamboo, no icing, and low wind. But the cutting, sweating, trimming, and measuring of the swr is a nightmare on a homebrew quad. And the humidity is so high that the bamboo rots in a couple of years, requiring restringing of the spider's web.

Also, a large portion of the amateur community is expatriate and lives here for only a few years. So, many of us are just setting up ham stations from scratch. And as the hams turn over, there is always someone else starting over again. Consequently, we make a lot of dipoles.

So here you are, out cutting copper wire on a hot weekend. The nice roll of #14 enamel-coated copper wire that you brought from the States that cost you a fortune is rapidly dwindling, and it makes you nervous to roll off another 20 feet. Cut, sweat, trim, and measure the swr. You would sure like to lend some of your friends some good wire when they make their own antennas, but soon you won't have enough for yourself. Your friends go to the electrical supply store in the capital city to buy their insulated rolls of copper wire, and you thank God during your evening prayers that you didn't have to stoop to paying for copper with gold and then have to strip the insulation off. Cut, sweat, trim, and measure the swr. The new antenna begins to take its final form. You pat yourself on the back and say to yourself that, if nothing else, you really know how to make an antenna. The antenna is finished and works fine.

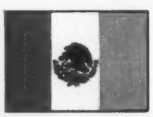
Later in the month, you help a new African ham make his own antenna using your design. Cut, sweat, trim, and measure the swr all over again. After a little snafu, it works perfectly. But that wire was just too expensive and you wish you had enough to just give the poor fellow so the struggling new ham didn't have to buy it.

Then you have a vision, you know, one of those sky-opening experiences where a voice calls out and gong goes off, something like when you have just worked a new country. You are walking past an old, dead, 10-kVA power-line transformer sitting on the ground. You know, the same one you have been walking by for the past three years. And you remember like a bolt of lightning the article you read a year ago about how there are nice high-tension transformers inside those big, ugly, rusting, grey cans. You also remember that even spoiled transformers have lots of wire in them, and that big spoiled transformers have big wires in them, and that the wires in transformers are enameled copper wires.

Then you plan for 2 or 3 weeks how you are going to get your hands on the transformer, and you make the necessary arrangements with the organization that you work with to take the old transformer which has been broken since as far back as anyone who presently works there can remember. They are, in fact, happy to get rid of it. Little do they know of the treasure inside. Why, you would steal for antenna wire in an emergency, and they are happy to get rid of it. The only catch is that they want the transformer coil that is inside, and that is just the part you don't want.

When you finally get the transformer out, it is so big you can hardly lift it off the ground. When you were a kid, you used to take a few small transformers apart and marvel at all the wire inside, but it was nothing like this. Lord knows that there must be hundreds of feet of wire in that thing. You get it home and start unwinding it. The wire on the high-tension primary is #14, exactly what you brought from the states, only 10 times as much, and free. There is so much wire that you will have enough for retirement when you can make antennas every day. And the low-tension secondary wire is the biggest single-strand wire you have ever seen in your life. In fact, it looks like a long copper bar 1/4 inch wide and 1/8 inch thick. There isn't so much of that, but you can already think of hundreds of uses for it.

And you suddenly realize that there are thousands of old broken transformers all over this country, and 10 kVA is the smallest that you can get. And you realize there will never be a wire problem again. And you sleep unusually well that night. Now if there was only an easy way to get insulators . . .



MEXICO

Mark K. Toutjian XE1MKT
Apartado Postal 42-048
06470 Mexico, D.F.

Little has been written with regard to "Mexico airwaves" and ham activity here down south of the border over the years. Nevertheless, much has been going on and most of it is known by our fellow colleagues within the country. We are constantly having DXpeditions, contests, and radio-club get-togethers, and ham-radio operators from all around the globe can qualify for one of the many diplomas (awards) available from the Liga Mexicana de Radio Experimentadores (what we might call the "Mexican Radio Relay League" or the "Mexican Radio Experimenter's League") which has its base in Mexico City and controls the radio clubs all around the country.

Many of the different radio clubs from different parts of Mexico also offer attractive diplomas to fellow hams around the world. Now that Mexico joins "73 International" with its own monthly column, I hope to cover practical material and up-to-date information for all of you *73* readers so you can qualify for and obtain diplomas from our Mexican Radio Experimenter's League, make your QSOs with our DXpeditioners, and enjoy current information that is also shared with our local hams.

At the time of this writing, a couple of DXpeditions happen to be going on here! One is going on at what we call "El Mar de Cortes" (The Sea of Cortes) near Baja, California, and the other at "La Isla de los Alcranes" (Scorpion Island) near the southern tip of the Yucatan Peninsula. There are also rumors of a few hams from Mexico who will be on a DXpedition by boat from Mexico via Africa. We will keep you informed of their schedules and frequencies beforehand.

Are you thinking about taking a vacation to Mexico in the near future? Did you realize that there are all kinds of tourist opportunities with Mexico's past devaluations? Perhaps you would like to listen in on two meters and would like to know more about the repeaters available throughout the country, especially in tourist zones. You will be informed about this, too, now that Mexico has joined "73 International." You may also have a few questions about regulations here in Mexico and agreements between Mexico and other countries. This also will be considered. As a correspondent for *73* from Mexico, I would like to invite our Mexican readers to get in touch with me by radio or mail upon hearing of or planning any DXpeditions, contests, radio-club activities, or otherwise. So, look for my column next month! Join in with Mexico, as Mexico joins "73 International." *Adios* and *hasta la vista* for now. 73 and DX!

THE NETHERLANDS

Henk Meerman PD0DDV
Zandvoorterweg 33
2111 GR Aerdenhout
The Netherlands

The national Dutch amateur-radio station PA0AA owned and operated by the largest amateur radio society in Holland, VERON, is on the air every Friday on the 80-, 20-, and 2-meter bands on 3.600 kHz, 14.100 kHz, and 144.8 MHz with the following schedule (times in UTC):

1900 News in Dutch (weather forecast, news about contests, etc.)
1915 News in English (weather forecast, news about contests, etc.)
1930 Code course for beginners
2000 Code course for the advanced
2030 RTTY news bulletin
2100 Repetition of the news in Dutch
2115 Repetition of the news in English

At 2130 UTC, PA0AA will be listening for amateurs with questions and will make some QSOs.

CB RADIO IN HOLLAND

Although it has little to do with amateur radio, I want to write something about CB radio in Holland. Every Dutch citizen who has reached the age of fourteen can get a license for CB. In Holland, only factory-made rigs with a special certification mark on the front are allowed. The output must not exceed 2 Watts. Furthermore, only the use of 40 channels and FM modulation with an omnidirectional antenna is permitted. The annual license fee is 35 Dutch florins. It is also possible for foreigners to get a CB license in Holland. For details and information, you can write to the Dutch Post and Telecommunication Administration. The address is: PTT Radiocontrole Dienst, afd.MARC.-machtigingen, Postbus 570, 9700 AN Groningen, The Netherlands.

SPECIAL AWARD

Among the many awards which we have in Holland, there is a very interesting and special one. It is the Airborne Memorial Award. This award is founded in remembrance of the airdrops of September, 1944, at Renkum, Wolfheze, and Oosterbeek previous to the battle of Arnhem (September 17, 1944).

The clear profit of this fund goes to the Airborne Forces Security Fund. The money from this fund in many cases helps the close relatives of flyers to come to Holland (Oosterbeek) and to make a visit to the graves of the men who gave their lives for our freedom during WWII.

Every year on the 17th of September, the hams who live in the region of Renkum and Oosterbeek will come on the airwaves and identify themselves with "CQ AMA" (Airborne Memorial Award). For details and information, write: PO Box 60, 6860 AB Oosterbeek, The Netherlands. Please enclose two international reply coupons.

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier, New Zealand

Greetings from ZL again. Over the next few months, I shall endeavor to cover some of the specialist groups within the structure of New Zealand amateur radio. The first on the list, in honor of its 21st birthday year, is the WARO Club, the Women's Amateur Radio Operators' Club of NZART.

WARO was formed as a result of a suggestion made to a small group of YL operators at the 35th annual conference of NZART at Hamilton in June, 1961. The idea was met with enthusiasm, national nets were begun in July, 1961, and all YL operators were contacted by letter outlining the proposal and advising details of the inaugural meeting at Rotorua on March 10, 1962. Those present at that first meeting were Thelma Souper ZL2JO, Florence Voss ZL1AXP, Judith Holland ZL1AWM, Celia Reed ZL1ALK, Jannette Barker ZL1ANA, Vicki Shaw ZL1OC, and Enid Rosen.

WARO was honored to have among its founding members a few YLs who had been on the air since the early 1930s, notably Thelma Souper, the first secretary/treasurer, and Myrtel Earland ZL4GR, New Zealand's first licensed YL operator, a lady of some renown who is still active after more than 50 years of amateur-radio operating.

The constitution of WARO, "to promote and encourage friendship and interest in

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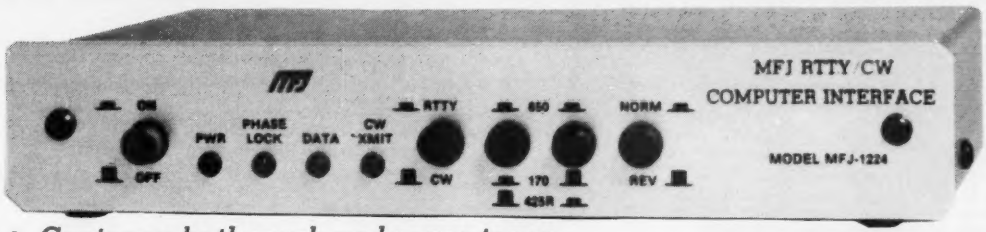
Lets you send and receive computerized RTTY/ASCII/CW. Copies all shifts and all speeds. Copies on both mark and space. Sharp 8 Pole active filter for 170 Hz shift and CW. Plugs between your rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 or most other personal computers. Uses Kantronics software and most other RTTY/CW software.



- *Copies on both mark and space tones.*
- *Plugs between rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers.*
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It plugs between your rig and your VIC-20. Apple, TRS-80C, Atari, TI-99, Commodore 64, and most other personal computers.

It uses the Kantronics software which features split screen display, 1024 character type ahead buffer, 10 message ports (255 characters each), status display, CW-ID from keyboard, Centronic type printer compatibility, CW send/receive 5-99 WPM, RTTY send/receive 60, 67, 75, 100 WPM, ASCII send/receive 110, 300 baud plus more.

You can also use most other RTTY/CW software with nearly any personal computer.

A 2 LED tuning indicator system makes tuning fast, easy and positive. You can distinguish between RTTY/CW without even hearing it.

Once tuned in, the interface allows you to copy any shift (170, 425, 850 Hz and all shifts between and beyond) and any speed (5 to 100 WPM on RTTY/CW and up to 300 baud on ASCII).

Copies on both mark and space, not mark only or space only. If either the mark or space is lost the MFJ-1224 maintains copy on the remaining tone. This greatly improves copy under adverse conditions.

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For example, you can use Galfo software with Apple computers, or RAK software with VIC-20's. Some computers with some software may require some external components.

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It uses Kantronics software which features CW receive 5-99 WPM, RTTY receive 60,67,75,100 WPM, and ASCII receive 110, 300 baud, plus more.

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radio amongst women radio operators," has been well fulfilled since the beginning with just a handful of members. Today, there are 92 licensed YLs, 37 overseas YL operators, and 23 associate members. These figures mirror the steady progress which is continuing, as well as WARO gaining worldwide recognition within international amateur-radio circles. The first overseas WARO member was Mildred K9HRH, who joined in 1963. She became a silent key in 1969.

In 1969, the WARO Award was introduced—it features an attractive certificate of "Pania of the Reef" (a female from Maori legends), with additional seals for extra YL contacts after the basic award. The details of the WARO Award appear later in the column.

The WARO also have an annual HF contest which is thoroughly enjoyed by YLs and OMs alike, the winner receiving the "Thelma Souper Memorial Cup," named in honor of Thelma, a founding member and past president of WARO, who bacame a silent key on 16 December 1977.

In 1981, WARO adopted an emblem and included it in a WARO badge which is now proudly worn by all members.

Pen pictures of some of the early WARO members must include the Grand YL of New Zealand amateur radio, Myrtle Earland ZL4GR. Myrtle, of Dunedin, better known to operators around the world as "Myrt," became ZL's first licensed woman amateur-radio operator in 1930 with the callsign OZ3AG. Like so many of the very early licensed operators, Myrt was an expert at CW; during World War II, Myrt and her OM, Fred ZL4AM, were at a QTH about 120 miles from Dunedin at Omakau. There they monitored the HF bands, recording coded enemy messages and sending them by a direct telephone "wire" to Dunedin. As Myrt dryly comments, it was the longest antenna she's ever had, but the landline had to be used because during the war years, amateur-radio operation was suspended and transmitters were sealed by the government to prevent unauthorized transmissions. In later years, Myrt moved to Dunedin, where she has had many contacts, but the most exciting to her was the one with an operator on board the prime recovery ship for the Apollo X astronauts on 28 May 1969.

Myrt has also been involved in emergency operations over the years, the earliest being the 1931 Napier earthquake, when she acted as a relay station for messages. More recently, Myrt was on duty in the Green Island (Dunedin) Civil Defense Headquarters during the Abbotsford landslip emergency.

For her 50 years as an amateur-radio operator, WARO presented Myrtle with a very special WARO Award in 1980, in recognition of the Grand YL of ZL radio.

Thelma Souper ZL2JO (silent key), who was first licensed in March, 1931, as ZL2FR, later ZL1CN and ZL2AO, operated 40 meters when 40 was a CW-only band. After World War II, Thelma was allocated ZL2JO, the callsign she held until her passing to the hall of silent keys. Thelma was a very active amateur operator during her career as a YL ham; she participated in the Eyeball Amateur Radio network, an American eye-bank net assisting the medical authorities with the transfer of eyes for transplants after accidents or medical emergencies. She was also a founding member of WARO, as well as holding the offices of secretary/treasurer and president over the years.

Florence Voss ZL1AXP, the first president of WARO, became interested in amateur radio when her OM, Sandy ZL1AWA, got his license. Florence was licensed in 1961 and was one of the small group of YLs at the Hamilton conference where WARO was conceived. She reminisces, looking back through her logbook, noting that the net members have increased so much in the ensuing years that there are now three WARO nets, a North Island, a South Island, and a National net, held on Monday nights through the month.

Another early member, Sylvia Kirkland ZL2LS (ex-ZL2QZ and -ZL1BCM) was first licensed in 1954, but her interest in radio goes back to 1922 when she was at school in Oxford, England. A demonstration at the school took two men two days to set up. They erected a massive antenna and had two large tables in the school hall loaded with gear. They were supposed to be listening to a stage musical relayed from London, but the set had no selectivity and all that could be heard were several CW stations, weather stations, shipping, etc., as well as plenty of static, but very little music. The men gave a talk on radio and how it worked; it was that demonstration which kindled her interest in radio and led her to a ham-operator's call in 1954. Sylvia now lives at Eskdale, a short distance north of Napier, New Zealand, and is still active on the air with the TS-520 her family gave to her for Mother's Day about seven years ago.

AWARDS

The WARO Award mentioned above is outlined here.

General: The certificate depicting "Pania of the Reef" is awarded for contacts on any band, SSB/CW/AM, from the same QTH, but net contacts or contest contacts are ineligible for the award. No QSLs required—send a certified list to: Custodian ZL1OC, PO Box 2088, Whakatane, New Zealand, with sufficient postage (IRCs) for the return of the certificate.

The Legend: An old Maori legend tells how Pania, a young Maori maiden, lured by the siren voices of the sea people, swam out to meet them. When she endeavored to return to her lover, she was transformed into the reef which now lies beyond the breakwater at Napier, New Zealand, and bears her name.

HF Bands: DX stations, work 6 resident ZL WARO members. Contacts to date from June 1, 1969. Endorsements for each additional 6 WARO member stations worked, which can include up to 3 overseas WARO members, are available. VK and ZL, work 6 North Island and 6 South Island WARO members for the basic award. Endorsements for every additional 12 WARO members worked.

Listeners: DX listeners, list 10 QSOs dating from June 1, 1969. Endorsements for each additional 5 QSOs heard. VK and ZL listeners, 20 QSOs heard. Endorsements for every additional 10 QSOs heard.

For those interested in this award, ZL YLs may be found each month on International YL Day, the 6th day of every month, on 14.288 either in QSO or calling on the hour, every hour, from about 0600Z. Good luck, and good certificate-hunting, as it is a very nice certificate to have.

BITS 'N' PIECES

NZART World Communications Activity Day, May 21, 1983, was an outstanding success, even though propagation for DX communication was not as good as it could have been. The 8 stations, ZLs 1/4 and 6/9WCY, operated most modes and most bands during the 24-hour period; the stations worked a total of 10,000+ contacts in nearly 100 countries, and about 300 participating hams and helpers were involved at some time or other during the day. QSLs will be sent from the log sheets for all contacts made with ZL WCY stations on that day, and there is no need for return QSL cards. Arthur Law ZL2HE, NZART vice president and coordinator of WCY Activity Day, 1983, and the New Zealand amateur fraternity thank all the DX and local stations who participated in our WCY day and helped to make it such a great success.

FUTURE HAPPENINGS IN ZL

JOTA, the Jamboree of the Air for the scouting movement, again will be well supported by ZLs in October; we look forward to many good QSOs with other DX stations during the JOTA.

ZL9WCY will be on the air again at a special-event station from the annual Hawkes Bay Agricultural and Pastural Show in October this year. Operating times from the show on 40, 20, 15, or 10 meters, depending upon propagation, will be from 2200Z to 0400Z, approximately, October 19, 20, and 21. The station also could be on the air at other times activated from home stations.

Rose City Conference, 1984: The Annual NZART Conference, 1984, will be held at Palmerston North, New Zealand. For any overseas amateurs who may be touring in this area, the conference will be held over the weekend of June 1-4. Enquiries sent to PO Box 1718, Palmerston North, will be promptly answered. If your holiday plans include ZL-land, we'd like to have you at our conference.

DX News: The Kermadecs, Raoul Island ZL/K, will be activated again soon. Warwick ZL3AFH, currently ZK1WL, Northern Cooks, will be working on Raoul Island for a period commencing later this year, but he will not be properly organized with antennas, etc., until about January, 1984. Warwick, I understand, will be as active as his duties permit and could be on RTTY and OSCAR as well as SSB. More information about the Kermadecs as it comes to hand. It is a rare one and has not been activated for a number of years.

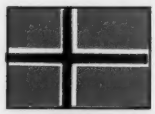
PEOPLE'S REPUBLIC OF CHINA

Rod Hallen KB7NK/DU1
Amembassy-RCPO
APO San Francisco 96528

On 27 May 1983, in the company of Karl K4YT and Jan KG3R, I visited BY1PK in Beijing, People's Republic of China. With the help of an interpreter, we had a long discussion about present and future ham-radio operations in China with Mr. Tong and Mr. Yan. BY1PK is now operating CW only, but plans for SSB operation at some unspecified future date are in the works. BY8AA is also on the air (CW only) from another Chinese province. It is expected that operations will also be started from Shanghai and Guangzhou (Canton) soon, possibly within the next 6 months.

The equipment at BY1PK at the present time consists of a Yaesu FT-107M, a Kenwood-Trio TS-930S, a Canadian 1-kW amplifier, and various clocks, keyers, etc. Antennas which are on top of a 7-story building about 100 feet above ground consist of a rotary Hy-Gain TH6DXX and 2 broadband dipoles. The antenna installations are very heavy-duty and look very professional. The station location is in a new building. Attempts last summer to visit BY1PK were not successful because the building was still under construction at that time. Mr Tong stated that all amateur-radio operators visiting in the People's Republic of China would be welcome to visit BY1PK. Arrangements can be made through the China Radio Sports Association and it would be well to bring your own interpreter since they are not always available at the station location.

When we explained to Mr. Tong, through the interpreter, the meaning of "eyeball QSO," he was quite happy to provide us with BY1PK cards commemorating our visit. When you visit, bring along a few of your own cards, also.



NORWAY

Bjorn-Hugo Ark LA5YJ
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MOBILING IN NORWAY

Norway is a wonderful country to spend your holidays in, especially while mobile operating. As always, plenty of time is essential, but who has enough time to spend on their vacation? It is wise to take it easy and concentrate on one part of the country instead of running through the country at full speed on the highways. That would not be much of a vacation at all. Spend some time in planning the vacation, select certain points to stay for a couple of days or more, and take shorter trips in that specific area.

On most maps, Norway may look little and tiny due to the type of projection used, but on the contrary, it will be nothing like that in reality. As an example, from the southernmost point, Cape Lindesnes, to the northernmost, the well-known North Cape, is over 2600 kilometers—and add another 700 kilometers if you would like to cover the distance to the Russian border. This distance is the same as the distance between Oslo, the capital, and the near-southernmost point in Italy, and bear in mind this is not the road distance, which will turn out to be quite a bit more.

I would suggest visiting the southeast or southwest part or, if the midnight sun is dragging, the northern part of the country. The scenery in any part is worthwhile seeing. Shifting from stony, treeless seasides to fertile green flatlands bulging with grain and vegetables, from endless spruce and pine forests to the wild and naked mountain ranges cut with vigorous valleys, together these form the country we Norwegians are so fond of.

Remember that the country has existed since about the year 1,000, and the oldest city, Tonsberg, is over 1,000 years old, closely followed by Trondheim, which will reach this age around 1990. It seems unbelievable, but all over the country you will very easily find buildings and other sights several hundred years old, with the exception of the northwestern part and northern Norway, where in coastal cities most of the buildings were bombed and burned down during the invasion and retreat of the German army in WWII.

You will find it quite interesting mobiling through a country with so much space for its inhabitants. Even in the city and county of Oslo, three-quarters of the area is covered with forest, wilderness, and farmlands. I wonder how many capital cities around the Western Hemisphere can show off something like that?

Some good advice before starting. Apply for your reciprocal license early so you will be sure to have it on hand before leav-

Continued on page 137

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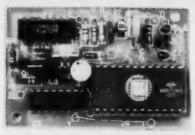

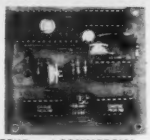

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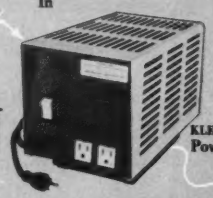

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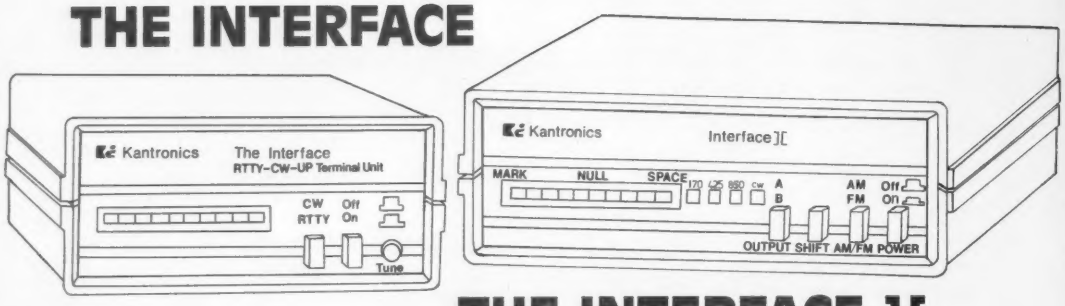
THE INTERFACE



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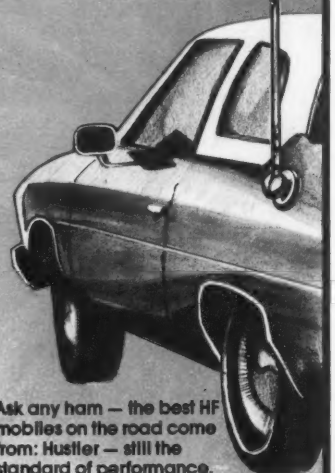

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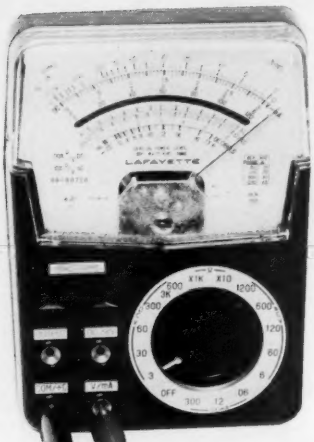

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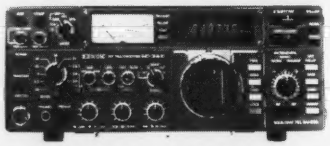

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It was originated by Peter Martinez, G3PLX (see June 1981 QST, p. 25). He first interpreted the international marine CCIR 476-1 specification for amateur use. Virtually all of the 400+ stations presently on AMTOR world wide are using software/hardware designs originated by Peter. The AMT-1 is a proven product which represents his latest and most highly refined design. It represents the culmination of over three years of development and on the air testing, and sets the standard against which all future AMTOR implementations will be judged.

Not only does it incorporate the latest AMTOR specification, but it gives superlative performance on normal RTTY, ASCII and CW (transmit only). As well as some fairly incredible real time microprocessor software, the AMT-1 boasts a four pole active receive filter, a discriminator type demodulator, a crystal controlled transmit tone generator, and a 16 LED frequency analyzer type tuning indicator, which is very easy to use.

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Since Ken and I each purchased a TRS-80 Color Computer™, we have been looking for applications relating to amateur radio. (One gets tired of balancing the checkbook and playing Space Invaders.) After Field Day last year, Ken decided he had found another computer application—and CALLSORT was born. This year, it was used again during Field Day and for other contests. CALLSORT is thoroughly debugged and can assist you when it is time to go over those log sheets.

```
                    20- SSB
1     WHCET     3A KS
2     WHDC      3A IA
3     W0DC      3A IA          DUP
4     KAHFLX    1D CO          DUP
5     KAHFLX    1D CO
6     WHGN      3A IA
7     WOHJ      2A IA
8     WBHJBY    1A SD
9     K0JV      1A SD
10    WHLAC     2A IA
11    K0ND      1A ND
12    WHOVUS    4A IA
13    W1AW      25A CT
14    K1FFF     2A W. MA
15    W1FP      2A VT
16    W1HFS     4A CT
17    W1NEM     5A CT
18    W1DF      4A RI
19    K2GO      2A NJ
20    K2HE      W NY
```

Fig. 1.

The program will let you enter data directly from a log sheet and print a sorted list with or without duplicates on a printer or the CRT. The program handles up to 500 calls if you have a 32K computer. (I probably will never work 500 stations on a single band in my life.) If you have a 16K machine, you will have to modify only lines 20 and 30. When you are done, you can save the log to tape for future reference. You also may stop at any time, save the calls you have entered, and continue entering calls at a later time. This works nicely when you get interrupted by those rare DX calls on 20 meters.

The program is well remarked and should be easy to follow. All remarks may be removed (the REM-line numbers end with a 5). For optimum speed, delete unnecessary spaces when entering the program; they have been left in our listing for easy readability.

One more note, before we look at the program operation in greater detail: In several locations you will find POKE commands. These are used to increase the processing speed of the Color Computer. Just before entering the sort routine in line 170, the computer processing speed is increased. Before tape and printer routines, it must be slowed down again.

Some color computers will not work when you try to increase the speed. If you have never tried this POKE before, *be sure* you save a copy of the program and verify it before you run the program! If the computer "locks up," your machine will not accept the high-speed POKE. To regain control, you will have to press RESET. Control should return to Basic and you should be able to continue work. Just remove the POKEs; the only thing you will lose is a little speed. (If you would like more information on using the high-speed POKE on machines that lock up, send your request and an SASE to Ken WØCZ.

Once the program is typed in and run, you will be prompted for keyboard or tape input. Select the keyboard option. Enter the call, a space, and the section. Fig. 1 is a sample printout of the program; use it as a guide to inputting call data. The numbers on the left are generated by the print routine and are not to be entered from the keyboard. If you make a mistake while entering a call, just press the backspace key. The entire line will be erased and you just reenter the line again.

Once all of the calls have been entered, enter #. You will be asked if you want to save to tape. Then you will be asked if you want a printed list. Just follow the prompts as desired.

The tape file is stored using the contest name. Contest names will automatically be abbreviated to an eight-letter filename. Each tape will contain the band and mode information you enter.

The program is also easily converted to Color Computer disk files. Remove the tape prompts and change all references to buffer #−1 to

```
5 'CALLSORT BY KEN CHRISTIANSEN V 1.1 8-23-82
10 CLS
20 PCLEAR 1:CLEAR 12000
30 DIM A$(500),AA$(500),AB$(500),AD$(500)
40 P=0
50 I=0
60 PRINT@11,"CALLSORT":PRINT@37,"BY KEN CHRISTIANSEN"
70 PRINT@224,"PRESS 1 TO INPUT FROM KEYBOARD"
80 PRINT@288,"PRESS 2 TO INPUT FROM TAPE"
90 R$=INKEY$:IF R$=""GOTO 90
100 IF R$="2" GOSUB 1590
105 '************GET CALLS********
110 CLS
120 PRINT:PRINT "INPUT CALL SIGN AS IN THIS      EXAMPLE      KA9ABC SECTION"
130 PRINT:PRINT "PRESS <#> TO START SORT"
140 IF R$<>"1" THEN:PRINT@426,R$
150 GOSUB 880
160 POKE 65494,0:GOSUB 710
165 '***********SORT CALLS*******
170 POKE 65495,0
180 X=0
190 X=X+1
200 IF X>I THEN GOTO 650
210 IF A$(X) = "ZZ" THEN 190
220 FOR Y=1 TO I
230 IF A$(Y)<A$(X) THEN X=Y
240 NEXT Y
250 POKE 65494,0
260 Z=Z+1
270 IF J=2 THEN Z=0
280 IF D=2 THEN Z=0
290 G$=AA$(X)+AB$(X)
300 IF G$=H$ GOTO 320
310 P=P+1
320 IF P=0 GOTO 380
330 PRINT USING "####";P;
340 PRINT TAB(6) AA$(X)+AB$(X);
350 PRINT TAB(13)AD$(X);
360 IF X=I GOTO 390
370 IF G$=H$ THEN PRINT TAB(28)"DUP";
380 PRINT
390 IF D=2 GOSUB 850
400 IF J=2 GOSUB 480
410 IF Z=10 GOSUB 450
420 A$(X)="ZZ"
430 H$=AA$(X)+AB$(X)
440 GOTO 190
450 INPUT "  PRESS <ENTER> TO CONTINUE";Z
460 Z=0
470 RETURN
475 '*********PRINTER ROUTINE*****
480 IF K<>2 AND G$=H$ THEN GOTO 570
490 PRINT#-2,TAB(LL)"";
500 IF P<100 THEN PRINT#-2," ";
510 IF P<10 THEN PRINT#-2," ";
520 IF P<>0 THEN PRINT#-2,P;
530 PRINT#-2, TAB(10+LL) AA$(X)+AB$(X);
540 PRINT#-2,TAB(20+LL) AD$(X);
550 IF X=I GOTO 570
560 IF G$=H$ THEN PRINT #-2,TAB(40+LL)"DUP";
570 PRINT #-2,CHR$(13);
580 IF X/50=INT(X/50)THEN GOTO 600
590 GOTO 640
600 PRINT@480,"";:PRINT "TO CHANGE LEFT MARGIN ENTER NEW LEFT MARGIN":INPUT"PRESS
  <ENTER> TO CONTINUE";LZ
610 IF LZ>0 THEN LL=LZ
620 PRINT#-2,TAB(10+LL)R$" CONTINUED"
630 PRINT#-2,"      "
640 RETURN
650 POKE 65494,0
660 IF J<>2 THEN 680
670 PRINT#-2,CHR$(13);
675 '*********END ROUTINE*********
680 CLOSE #-1:CLS:PRINT@224,"ANY MORE CALLS (Y/N)?"
690 A$=INKEY$:IF A$="" THEN 690
700 IF A$="Y" THEN RUN ELSE END
705 '*GET TAPE AND PRINT OPTION*
710 CLS:PRINT:PRINT:PRINT:PRINT:INPUT "    ENTER 2 FOR TAPE COPY ";D
720 IF D<>2 GOTO 740
730 CLS:PRINT@132,"POSITION TAPE AND PRESS          RECORD AND PLAY"
740 PRINT:PRINT:PRINT:PRINT:PRINT:INPUT "    ENTER 2 FOR HARD COPY ";J
750 IF J<>2 AND D<>2 THEN 840
760 CLS:PRINT@198,;:INPUT "BAND AND MODE";R$
770 CLS:PRINT@198,;:INPUT "AMOUNT OF LEFT MARGIN";LL
780 IF J<>2 THEN 810
790 PRINT#-2,TAB(20+LL)R$
800 CLS:PRINT@195,;:INPUT "ENTER 2 IF YOU WANT DUPLICATES PRINTED ON HARD COPY";
K
810 IF D<>2 THEN 840
815 '********SAVE TO TAPE********
820 INPUT "ENTER NAME OF CONTEST";FI$:IF LEN(FI$)>8 THEN FI$=LEFT$(FI$,8)
830 OPEN"O",#-1,FI$
840 RETURN
850 IF G$=H$ THEN GOTO 870
860 PRINT#-1, R$,AA$(X),AB$(X),AD$(X)
870 RETURN
875 '***GET CALL AND SECTION*****
880 I=I+1
890 BJ=128+(32*I)
900 IF BJ>448 THEN BJ=448
910 PRINT@BJ,"                                    ";:
920 PRINT@BJ,"";:
930 BA$=INKEY$
940 BA$=""
950 IF BA$=CHR$(13) THEN BA$=""
960 IF BA$=CHR$(8) THEN I=I-1
970 IF BA$=CHR$(8) THEN BJ=BJ-32
980 IF BA$=CHR$(8) GOTO 900
990 IF BA$="" GOTO 930
1000 IF BA$="@" GOTO 160
1010 PRINT@A9,;
1020 BB$=INKEY$
1030 IF BB$=CHR$(13) THEN BB$=""
1040 IF BB$=CHR$(8) GOTO 890
1050 IF BB$="" GOTO 1020
1060 BB=ASC(BB$)
1070 IF BB>47 AND BB<58 THEN BC$=BB$
1080 IF BB<47 AND BB<58 THEN BB$=""
1090 IF BB$="" GOTO 1160
1100 PRINT BB$;;
1110 IF BB$="" GOTO 1170
1120 BC$=INKEY$
1130 IF BC$=CHR$(13)"THEN BC$=""
1140 IF BC$=CHR$(8) GOTO 890
1150 IF BC$="" GOTO 1120
1160 PRINT BC$;;
1170 BD$=INKEY$
1180 IF BD$=CHR$(13) THEN BD$=""
1190 IF BD$=CHR$(8) GOTO 890
1200 IF BD$="" GOTO 1170
1210 PRINT BD$;;
1220 IF BD$="$" GOTO 890
1230 BE$=INKEY$
1240 IF BE$=CHR$(8) GOTO 890
1250 IF BE$="" GOTO 1230
1260 IF BE$=CHR$(13) GOTO 1290
1270 IF BE$=CHR$(32) GOTO 1290
1280 GOTO 1320
1290 BE$=""
1300 BF$=""
1310 GOTO 1420
1320 PRINT BE$;;
1330 BF$=INKEY$
1340 IF BF$=CHR$(8) GOTO 890
1350 IF BF$="" GOTO 1330
1360 IF BF$=CHR$(13) GOTO 1390
1370 IF BF$=CHR$(32) GOTO 1390
1380 GOTO 1410
1390 BF$=""
1400 GOTO 1420
1410 PRINT BF$;;
1420 PRINT TAB(8)"";;
1430 BG$=INKEY$
1440 IF BG$=CHR$(8) GOTO 890
1450 IF BG$=CHR$(13) AND BH$="" THEN BG$=""
1460 IF BG$=CHR$(32) AND BH$="" THEN BG$=""
1470 IF BG$="" GOTO 1430
1480 IF BG$=CHR$(13) GOTO 1530
1490 PRINT BG$;;
1500 BH$=BH$+BG$
1510 GOTO 1430
1520 PRINT
1530 AA$(I)=BA$+BB$
1540 AB$(I)=BC$+BD$+BE$+BF$
1550 AD$(I)=BH$
1560 A$(I)=AB$(I)+AA$(I)
1570 PRINT:PRINT:
1580 GOTO 880
1585 '****LOAD A TAPE FILE******
1590 CLS:PRINT@224,"POSITION TAPE AND PRESS PLAY"
1600 INPUT"ENTER NAME OF CONTEST";FI$
1610 IF LEN(FI$)>8 THEN FI$=LEFT$(FI$,8)
1620 CLS:PRINT@224,"SEARCHING"
1630 OPEN "I",#-1,FI$
1640 I=0
1650 I=I+1
1660 IF EOF(-1) THEN 1710
1670 INPUT#-1, R$,AA$(I),AB$(I),AD$(I)
1680 PRINT@426,R$
1690 A$(I)=AB$(I)+AA$(I)
1700 GOTO 1650
1710 CLOSE#-1
1720 I=I-1
1730 CLS:PRINT@141,R$
1740 PRINT@419,"PRESS <ENTER> TO CONTINUE"
1745 '*DELETE UNWANTED ENTRIES**
1750 PRINT@131,"";:INPUT "TYPE IN NUMBER OF RECORD IF      YOU WANT TO DELETE AN
ENTRY          THAT WAS ON THE TAPE?          ";ZA
1760 A$(ZA)="":AA$(ZA)="":AB$(ZA)="":AD$(ZA)=""
1770 RETURN
```

Program Listing.

#1 by just deleting the − sign. To convert CALLSORT to run on a Model I or III, the OPEN and CLOSE statements may be deleted. Disk systems should run as is, with the buffer number change. Change all PRINT #−2 references to LPRINT and remove the POKEs.

As you can see by Fig. 1, you can list duplicate entries on the printer. If you want to use the printout to send to the contest authorities, just press <ENTER> when prompted about printing duplicate entries. If you don't have a printer, a sorted list of the calls will be displayed, a screenful at a time. If you are copying them by hand, just press <ENTER> to view the next group of calls.

The program produces a total count of entries—notice that duplicates have the same number on the list. The number by the last call on the list is your total number of valid contacts. To delete a call from the list, read the list in from tape. Enter the number of the call to be deleted as listed on the printout and rewrite the file to tape. You will be prompted for this if you select the INPUT FROM TAPE option 2 at the beginning of the program.

One last comment about the sort. Those who are interested in such things will find the sort routine to be a Basic bubble sort. Though relatively slow, it is infinitely faster than I could sort by hand. Typically, it takes about 3 seconds for the next call on the list to be displayed. I would be interested, though, in hearing from anyone who might improve the performance of this routine.

Ken and I have found that the program takes out just about all of the drudgery of contest logging. Just a few minutes entering the log sheets into the computer is all that is required. The program is especially useful when used by multi-operator stations where duplicates are easily overlooked on multiple log sheets.

If you are like me, you hate to type in long Basic programs. We will send a copy of the program on cassette for $5.00. Specify cassette or disk version, and mail your request to Ken.

A few moments entering this program now will save lots of time after the next contest—time that can be much more profitably used discussing contest results over the local repeater. 73 and happy contesting! ■

Robin Rumbolt WA4TEM
1134 Glade Hill Drive
Knoxville TN 37919

World's Fair Super Squelch

With this two-digit DTMF decoder—a perfect club project—you hear only calls meant specifically for you.

Early in the planning stages for the world's fair amateur radio station, WA4KFS, it was decided that a telephone in the station would not be desirable. After all, we wanted to demonstrate the usefulness of radio—and the budget was tight. A telephone seemed out of place. Still, there was a need for a way to get through to the station's control operator without forcing him to monitor a normally busy repeater. Since each of the directors of the Tennessee Wireless Association, the station's sponsor, had touchtone™ capabilities, a touchtone-operated squelch was the obvious answer. The circuit presented here is the one that we used at the fair.

Description

The circuit in Fig. 1

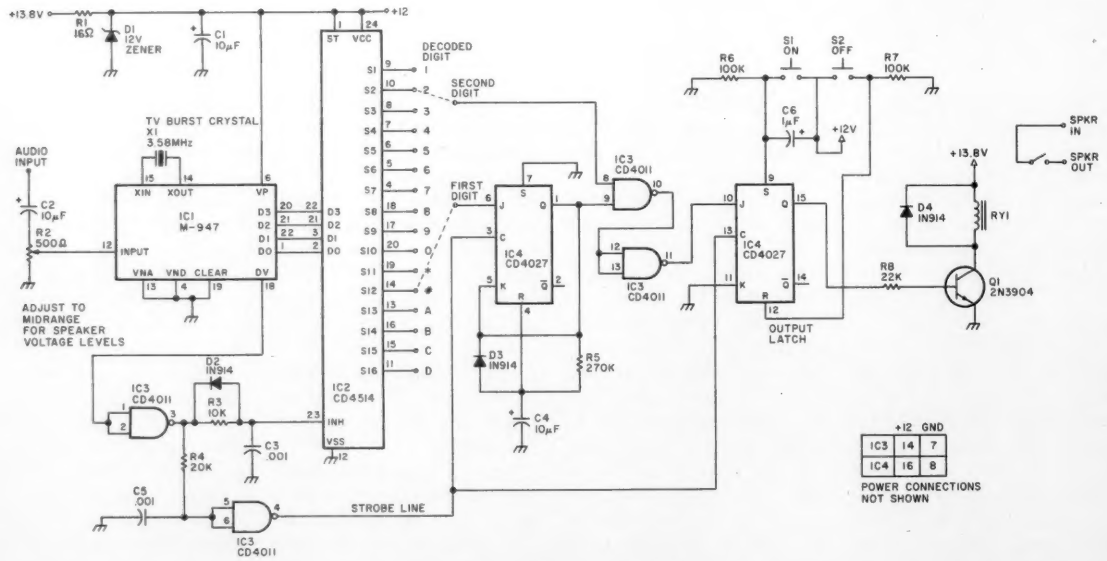

Fig. 1. Touchtone squelch schematic.

makes use of the M-947 DTMF decoder from Teltone, of Kirkland, Washington. The 947 has, on a single IC, all of the filters, amplifiers, and tone detectors needed to detect all 16 touchtone digits and output the corresponding binary codes.

These binary codes are then routed to a CD4514 four-to-sixteen-line decoder IC which activates a single output line for each touchtone digit. The outputs of this IC should then be connected to the proper stages of the sequence detector corresponding to your desired access code.

Also attached to the 947 decoder are a couple of gates wired as inverters and used with a couple of RC networks to provide delays in strobe-line timing needed to ensure proper clocking of the sequence detector.

The CD4027 dual J-K flip-flop IC is used as a sequence detector. In our case, we needed only a two-digit sequence. However, any number of flip-flops may be wired in series to provide sequence codes of any length. One flip-flop is needed per digit. A four-digit sequence detector is shown in Fig. 2.

Resistor R5 and capacitor C4 form a timer which resets the detector about one second after the first digit of the sequence is received. In this way, not only must the proper sequence be received, but it also must be received in a given time. This guard time may be adjusted for longer sequences according to the formula: Time in seconds = RC/2, where R is in Ohms and C is in microfarads.

The last stage of the sequence detector is the output latch. Attached to its set-and-reset inputs, momentary push-button switches S1 and S2 are provided for local control of the squelch. Pressing S1 will enable the speaker, while pressing S2 will disable the speaker until the next correct sequence is received.

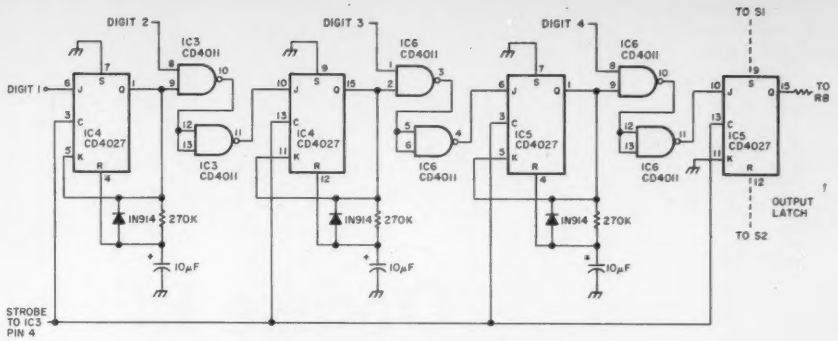

Fig. 2. Four-digit sequence detector.

Transistor Q1 is used as a buffer/driver between the output latch and reed relay RY1. Relay RY1 is connected in series with the radio's speaker leads.

One last comment. Since the M-947 is limited to a maximum power-supply voltage of 13.5 V, a 12-volt zener is included to protect the decoder from power supplies with 13.8-volt outputs. Yes, it is *that* critical!

Construction and Operation

Our two-digit detector was built on perfboard in a Bud CU124 die-cast minibox. It was then wired into the accessory socket of a KDK2025 MK11 2m transceiver.

Before applying power, set your rig's volume control to a normal listening level and then apply power to the circuit. The circuit will always come on in the unsquelched condition. If the opposite is desired, connect capacitor C6 across the off switch, S2, instead of across S1. Now, using another transmitter, send the desired access code to the receiving rig. The speaker will be enabled after the last digit of the access code is released. The speaker then will remain enabled until turned off locally with the off button. Although no circuit for turning off the speaker remotely was included in this design, another sequence detector could be built with its output feeding the K input of the output latch to accomplish this task. ■

Parts List

Designation	Description	Price Each	Total
R1	16 Ohm, ¼ W, 5% (15 Ohm may be used)	.06	$ .06
R2	500 Ohm, ¼ W potentiometer	.59	.59
R3	10k Ohm, ¼ W, 10%	.06	.06
R4	20k Ohm, ¼ W, 5%	.06	.06
R5	270k Ohm, ¼ W, 5%	.06	.06
R6, R7	100k Ohm, ¼ W, 10%	.06	.12
R8	22k Ohm, ¼ W, 10%	.06	.06
C1, C2, C4	10-uF electrolytic, 15 volt or greater	.59	1.77
C3, C5	.001-uF, 50-volt ceramic disc	.20	.40
C6	1-uF electrolytic, 15 volt or equivalent	.59	.59
D1	Zener diode, 12 volt, 1 Watt, 1N4742 or equivalent	.45	.45
D2-D4	1N914 or equivalent	.10	.30
Q1	Transistor NPN 2N2222, 2N3904, or equivalent	.69	.69
IC1	*Teltone M-947 DTMF decoder	53.00	53.00
IC2	CMOS CD4514, 4-bit latch, 4-to-16-line decoder	3.95	3.95
IC3	CMOS CD4011, quad NAND gate	.39	.39
IC4	CMOS CD4027, dual J-K flip-flop	.69	.69
X1	Crystal TV Color Burst, 3.579545 MHz	1.98	1.98
RY1	12 V dc SPST	2.99	2.99
S1, S2	Push-button momentary SPST (RS 275-1547)	.50	1.00
MISC	IC socket, 14 pin	.20	.20
	IC socket, 16 pin	.22	.22
	IC socket, 22 pin	.37	.37
	IC socket, 24 pin	.38	.38
	Perfboard (RS 276-1390)	1.39	1.39
	Minibox, Bud CU124	4.40	4.40
		Total	$76.17

*Available from Teltone Corp., PO Box 657, 10801 120th Ave. N.E., Kirkland WA 98033; (206)-827-9626.

Terry F. Staudt WØWUZ
4807 S. Blue Spruce Road
Evergreen CO 80439

Defuse RFI

A clean signal starts with a good earth ground. Make yours better with some coax and capacitors.

As a long-time denizen of 10 meters, I have learned along with my like-minded compatriots to suffer when the band is really running well and our friends from 80, 40, and 20 come up to partake of the fun and games. Suffer? You bet!

A ground wire is totally ineffective over 1/8 wavelength on the frequency in use. Dc yes; rf no. This works out to about 4 feet on ten. I realize it is extremely difficult to achieve a situation where your ground wire is 4 feet or less, *to the earth,* not the toilet!

Another problem (coincidental with the above) is rf feedback in the TX audio which in its least annoying form makes your voice sound like vibrating chicken wire and in its worst sends spurs running 100 kHz up and down from your center frequency (or from dc to daylight, as we used to say in Navy ECM).

For considerably less than $5.00, there are steps to take that can result in hearing, either while in QSO or afterwards when the station you worked is talking with someone else, "Lord, that guy in—had beautiful audio!" These measures are not new, but like so many other pieces of hands-on know-how, need to be repeated and correlated every now and then to refresh and instruct those who don't read electronics books on the john.

If your rig is in the basement, effect a ½" 45° hole in the wall with a masonry bit or star drill and drive a 6- to 8-foot ground rod, leaving about 5 inches protruding. Seal with waterproof putty or silicone. Properly placed, this will give you about a 1-foot ground connection. For those not in the basement, a coaxial ground[1] is needed. This is a simple miracle that makes your effective ground length only a few inches!

A coax ground is made using *good* quality (95% shield braid) coax such as Columbia 1107 or 1108 RG-8X or Mini-8 with a stranded center conductor. The center conductor is used as the ground wire, connected to the *rf generating unit* and the outside ground system. It's by-passed at each end with a .01-uF, 1-kV disc capacitor to the shield braid (see Fig. 1). Don't tie all of your station's components together with zip cord or aluminum wire. Let the coax shield handle the dc grounding between units as it is seldom over a foot or so long. Otherwise you set up ground rf loops that defeat everything you've done.

Microphones seem to be universally designed for use in high school auditoriums, with no rf suppression whatsoever. This is simple, so simple that there is absolutely no excuse for rf feedback in this area. All that is usually necessary is to install a .01-uF disc capacitor across the microphone cartridge (do it quickly, because it can't take much heat!) and add a 1-mH choke in series with the audio high lead. This may be done at the mike or on the inside of the mike jack of the transmitter, which is more convenient when using several microphones. If using a power mike, ferrite beads on the transistor base leads and a "pi" filter using two .005-uF capacitors with a 1-mH choke is called for (Fig. 2).

In summation, there is absolutely no excuse for the cruddy signals on HF, and if you're not going for the solution, you're certainly part of the problem. These steps will also knock an RFI problem in the ditch. ■

Reference

1. *73 Magazine*, May, 1980, p. 82, "The Capacitive Coaxial Ground Wire."

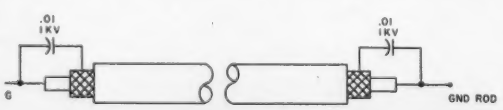

Fig. 1.

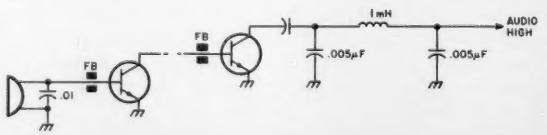

Fig. 2.

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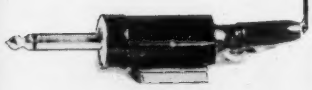

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SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

WOODBRIDGE NJ
OCT 1

The De Vry Technical Institute Amateur Radio Club will hold its annual flea market on October 1, 1983, from 9:00 am to 4:00 pm, in the school parking lot, 479 Green Street (between Rtes. 1 and 9), Woodbridge NJ. Admission is $3.00 for sellers and free for buyers. No electricity will be available. For further information, contact Frank Koempel WB2JKU, De Vry Technical Institute, 479 Green Street, Woodbridge NJ 07095.

SYRACUSE NY
OCT 1

The Radio Amateurs of Greater Syracuse (RAGS) will hold their annual Hamfest and Computer Display on Saturday, October 1, 1983, from 9:00 am to 6:00 pm, at the Art and Home Center, New York State Fairgrounds, Syracuse NY. Admission is $3.00 at the door. Featured will be commercial exhibitors, a large indoor and outdoor flea market, tech talks, an ARRL booth, displays, women's activities, contests, and entertainment. Hot food and beverages will be served. Talk-in on .90/.30, .31/.91, and .52 simplex. For further information, contact RAGS, Box 88, Liverpool NY 13088.

WARRINGTON PA
OCT 1-2

The Pack Rats (Mt. Airy VHF ARC) cordially invite all amateurs and their friends to the 7th annual Mid-Atlantic VHF Conference which will be held on Saturday, October 1, 1983, from 9:00 am to 5:00 pm, at the Warrington Motor Lodge, Route 611, Warrington PA, and to their 12th annual Pack Rat Hamarama on Sunday, October 2, 1983, at the Bucks County Drive-In Theater, Route 611, Warrington PA. The conference will feature an all-day VHF program, a cocktail hour and get-together at 6:30 pm, and a buffet dinner ($12.00 each) at 7:30 pm. Conference registration is $5.00 at the door and includes admission to the Hamarama. Admission to the Hamarama flea market on Sunday is $3.00 and tailgating is $5.00. The gate will open at 7:30 am, rain or shine (bring your own tables). Talk-in on 146.52 MHz (W3CCX). For further information, contact Lee A. Cohen K3MXM, 8242 Brookside Road, Elkins Park PA 19117, (215)-635-4942.

ROME GA
OCT 2

The Coosa Valley ARC will sponsor the Rome Hamfest on Sunday, October 2, 1983, at the Rome Civic Center, Turner-McCall Boulevard, Rome GA. A barbecue and all the trimmings will be available. For further information, contact Libbie Steadham WD4PTE, 18 Poplar Street, Rome GA, or phone (404)-291-4658.

ROCK HILL SC
OCT 2

The 32nd annual Rock Hill Hamfest will be held on October 2, 1983. For further information, contact YCARS, Box 4141 CRS, Rock Hill SC 29730.

CEDAR RAPIDS IA
OCT 2

The Cedar Valley Amateur Radio Club (WØGQ) will hold its 9th annual ARRL CVARC Hamfest on Sunday, October 2, 1983, beginning at 7:00 am, at the Hawkeye Downs Exhibition Building, Cedar Rapids IA. Tickets are $2.00 in advance and $3.00 at the door. Tables are $5.00 for the first and $7.00 for others. There is an overnight camping area, picnic facilities, ample parking, and a concession stand. There will be movies, manufacturers, dealers, and ARRL representatives featured. Talk-in on 146.16/.76, .52, and 223.34/.94 MHz. For advance tickets or reservations, write CVARC Hamfest, PO Box 994, Cedar Rapids IA 52406.

YONKERS NY
OCT 2

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Fair and Giant Flea Market on Sunday, October 2, 1983, from 9:00 am to 4:00 pm, rain or shine, at the Yonkers Municipal Parking Garage, corner of Nepperhan Avenue and New Main Street, Yonkers NY. Admission is $2.00 each and children under 12 will be admitted free. Gates will be open to sellers at 8:00 am and there will be a $6.00 admission per parking space which will also admit one (bring your own tables). Refreshments, free parking, and sanitary facilities will be available, as well as unlimited free coffee. There will be live demonstrations all day and a giant auction at 2:00 pm. Talk-in on 146.265T/146.865R or .52 direct. For more information, write YARC, 53 Hayward Street, Yonkers NY 10704, or phone (914)-969-1053.

ORLANDO FL
OCT 7-9

The second of two Great Southern Computer and Electronics Shows will be held on October 7-9, 1983, at the Orlando Expo Center, Orlando FL. Features will include computer hardware and software, peripherals, accessories, and word and data processing. Exhibits will include commercial and personal electronics, video products, robotics, and communications equipment. There will also be classes, workshops, seminars, and panel discussions. For registration information, exhibitors and attendees should contact Great Southern Computer and Electronics Shows, PO Box 655, Jacksonville FL 32201, or phone (904)-384-6440.

DEERFIELD NH
OCT 8

The Hosstraders will hold their annual autumn swapfest on Saturday, October 8,

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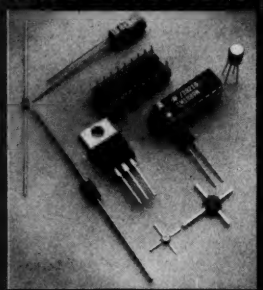

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1983, rain or shine, at the fairgrounds, Deerfield NH. Admission is $1.00, which includes tailgating. After 4:00 pm Friday, there will be camping for self-contained rigs; no reserved spaces will be available. Profits benefit the Shriner's Burns Institute (last May's donation was $2,702). For further information or a map, send an SASE to Norm WA1IVB, RFD Box 57, West Baldwin ME 04091; Joe K1RQG, Star Route, Box 56, Bucksport ME 04416; or Bob W1GWU, Walton Road, Seabrook NH 03874.

MEMPHIS TN
OCT 8-9

Six Memphis radio clubs will sponsor the Memphis Hamfest on Saturday and Sunday, October 8-9, 1983, at the Mid-South Building, Memphis Fairgrounds, Memphis TN. There will be computer displays, software, radio displays, and a flea market (tables on site). Dealers and flea-market sellers may set up on Friday evening, October 7th, until 9:00 pm. Activities will include radio and computer forums, women's programs, and a hospitality party on Saturday night. There will be on-site hookups. Talk-in on .28/.88 and .34/.94. For reservations or more information, contact Clayton Elam K4FZJ, 28 No. Cooper, Memphis TN 38104, or phone (901)-274-4418 (daytime) or (901)-743-6714 (nighttime).

VIRGINIA BEACH VA
OCT 8-9

The 8th annual Tidewater Amateur Radio Hamfest/Computer Convention/Electronic Flea Market will be held on Saturday and Sunday, October 8-9, 1983, at the pavilion at Virginia Beach VA. For both days, the admission is $4.00 and the hours are 9:00 am to 5:00 pm. Flea-market tables are $5.00 for one day and $8.00 for both days; for commercial dealers for both days, table space in the exhibition area is $15.00 and booths are $30.00. Features will include dealers, special displays, forums, computers, and satellite equipment. For tickets and more information, write Jim Harrison N4NV, 1234 Little Bay, Norfolk VA 23503, or phone (804)-587-1695.

BOSTON MA
OCT 8-10

PC '83, an international conference and exposition featuring IBM personal computers and compatibles, will be held on Saturday, Sunday, and Monday, October 8-10, 1983, from 10:30 am to 5:30 pm daily, at the Bayside Exposition Center, Boston MA. A three-day exhibit-and-conference ticket is $25.00 and a one-day exhibits-only ticket is $10.00. Features will include PC application discussions, technical information, and general sessions for IBM PC users. For more information, write Northeast Expositions, 822 Boylston Street, Chestnut Hill MA 02167, or phone (617)-739-2000, or (800)-841-7000 (outside Massachusetts).

WAUKESHA WI
OCT 9

The Kettle Moraine Radio Amateur Club will hold its annual Ham, Computer, Video Fest on Sunday, October 9, 1983, at the Waukesha County Expo Center, Highways F and FT, Waukesha WI. Tickets are $2.00 in advance and $3.00 at the door. Tables are $3.00 for each 4-foot length; reservations will be accepted until September 26, 1983. Since all facilities will be indoors, the hamfest will be open rain or shine, beginning at 8:00 am. There will be food available and commercial exhibitors. For reservations, send a check (payable) to KMRA Club, PO Box 411, Waukesha WI 53187.

BEDFORD IN
OCT 9

The Hoosier Hills Ham Club will hold its 22nd annual Hoosier Hills Hamfest on Sunday, October 9, 1983, at the Lawrence County 4-H Fairgrounds, 4 miles southwest on US Highway 50, Bedford IN. Registration is $3.00 per person and the swap shop is $2.50 (bring your own tables). The gate will open at 10:00 am on Saturday, Oct 8th, for campers and flea-market setups (registration required). There will be a free fish fry, campfire, entertainment, coffee, and overnight camping on Saturday night. Features will include ladies' free bingo and food served at the hamfest on Sunday. Talk-in on 146.13/.73 and setup on 3910 kHz. For further information, contact Dick Reistter KA9JTZ, Secretary, Hoosier Hills Ham Club, Box 891, Bedford IN 47421.

GRAND LEDGE MI
OCT 9

The Central Michigan Amateur Radio Club and Lansing Civil Defense Repeater Association will hold their annual Hamfair on Sunday, October 9, 1983, from 8:00 am to 3:00 pm, at the high school in Grand Ledge MI (7 miles west of Lansing). Donations for adults are $2.50 and tables are 75¢ per foot. There will be amateur radio equipment, antennas, computers, publications, demonstrations, films, a cafeteria, dealer sales, a swap shop, and hand-crafted items. For additional information, write Rowena Elrod KA8OBS, 111 Lancelot Place, Lansing MI 48906, or phone (517)-372-5462, or write Hamfair 83, PO Box 18044, Lansing MI 48901.

LIMA OH
OCT 9

The Northwest Ohio Amateur Radio Club will sponsor the 9th annual hamfest on Sunday, October 9, 1983, beginning at 6:00 am, at the Allen County Fairgrounds, Lima OH (exit 125/126 east, 1 mile from I-75). Admission is $3.00 in advance and $3.50 at the gate; full tables are $6.00 and half tables are $3.50. Camping will be free and electrical hookups are $7.00. Talk-in on 146.07/.67 (primary), 147.63/.03, and 146.52/.52. For more information or reser-

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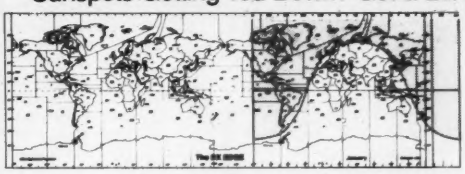

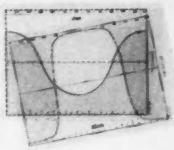

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vations (please include check), write NOARC, Box 211, Lima OH 45802.

IRWIN PA
OCT 15

The Irwin Area Amateur Radio Association will hold a Swap & Shop on Saturday, October 15, 1983, at the Circleville V.F.D., just off Route 30, 3.5 miles west of the Pennsylvania Turnpike, Exit 7. There will be food, vendors, a flea market, and free parking. Talk-in on 146.925/.325 and 146.52 MHz. For further information, contact Rick Jackson N3DAA, 39-D Lower Boone Drive, Turtle Creek PA 15145, or phone (412)-829-1953.

NEW ORLEANS LA
OCT 15-16

The New Orleans hamfest-computerfest, Amacom '83, sponsored by the Jefferson Amateur Radio Club, the Greater New Orleans Amateur Radio Club, the Delta DX Association, and the New Orleans VHF Club, will be held on October 15-16, 1983, at Delgado Community College's City Park campus, New Orleans LA. Admission is $5.00 per person and $1.00 per family member. Features will include an expanded flea market, commercial electronics exhibits, a banquet, tours of New Orleans, meetings, amateur radio tests by the FCC, and many interesting speakers. The host hotel is Howard Johnson's Motor Lodge Airport, 6401 Veterans Memorial Boulevard, Metairie LA 70003. Talk-in on 147.285/.885 or 449.0/444.0 (W5GAD/R). For reservations (deadline is October 5th) and more details, write Amacom '83, PO Box 73665, Metairie LA 70033, or call W. D. "Bill" Bushnell WA5MJM, Chairman, at (504)-887-5022.

REVERE MA
OCT 16

The 19-79 Amateur Radio Association of Chelsea MA will hold its fall flea market Sunday, October 16, 11:00 am to 4:00 pm (open to sellers at 10:00), at the Beachmont VFW Post, 150 Bennington Street, Revere. Admission is $1.00. Sellers' tables are $6.00 in advance, and $8.00 at the door if available. Talk-in on .19/.79 and .52. For table reservations, send a check to 19-79 Amateur Radio Association, PO Box 171, Chelsea MA 02150.

CHICAGO IL
OCT 16

The 2nd annual CCRL Hamfest will be held on Sunday, October 16, 1983, from 7:00 am to 2:00 pm, at the American Legion Post #21, 6040 N. Clark Street, Chicago IL 60660. Admission is $1.00 in advance or $1.50 at the door. Tables are $2.00 each. Talk-in on 145.030 simplex. For more information, write John Ibes KA9FUI, 2934 N. Mobile, Chicago IL 60634, or Fred Marlette KA9FUO, 1851 W. Chase, Chicago IL 60626.

SAVANNAH GA
OCT 22-23

The Amateur Radio Club of Savannah will hold a hamfest on October 22-23, 1983, at the National Guard Armory on Eisenhower Drive, Savannah GA. Admission is $2.00 for adults and children under 12 will be admitted free. Tables are $7.00 for the first table, which includes one admission ticket, and $5.00 for each additional table. There will be dealers, forums, a flea market, refreshments, and plenty of free parking. On Saturday, doors will be open from 9:00 am to 4:00 pm; on Sunday, from 9:00 am to 3:00 pm. Talk-in on .37/.97 and .28/.88. For further information, write Amateur Radio Club of Savannah Hamfest, PO Box 13342, Savannah GA 31416.

CHATTANOOGA TN
OCT 22-23

Hamfest Chattanooga and the Tennessee State ARRL Convention will be held on October 22-23, 1983, at the Chattanooga State Technical Community College, Amnicola Highway, Chattanooga TN. Activities will include forums, contests, and non-ham programs. The college cafeteria will be open for serving breakfast and lunch both days. For reservations for special "Hamfest Chattanooga" rates, write Ramada Inn, East Ridge (I-75 and US41), or phone (615)-894-6110. A hospitality party will be held at the Inn on Saturday, October 22. For further information, inside dealer area reservations, and inside and outside flea-market spaces, contact Hamfest Chattanooga, PO Box 3377, Chattanooga TN 37404, or phone Nita Morgan N4DON at (404)-820-2065.

LANCASTER PA
OCT 23

The Red Rose Repeater Association and Sercom, Inc., will sponsor the Red Rose Computerfest on Sunday, October 23, 1983, from 9:00 am to 4:00 pm, at the Guernsey Sales Pavilion, junction of Rtes. 30 and 896, east of Lancaster PA. Admission is $3.00; children under 14 and XYLs will be admitted free. Inside tables are available by reservation and tailgating is $2.00. Computers and amateur radio equipment will be featured. Talk-in on 147.615/.015, 146.01/.61, and 146.52 simplex. For more information, contact the Computerfest Committee, PO Box 5029, Lancaster PA 17601.

KALAMAZOO MI
OCT 23

A hamfest/electronic flea market will be held Sunday, October 23, 1983, 10:00 am to 4:00 pm, at the Kalamazoo Fairground. Tickets are $2.00 in advance and $2.50 at the door. Over 400 4-foot table spaces and table rentals are $2.50 each in advance, $3.00 at the door. Trunk sales $2.00 if all

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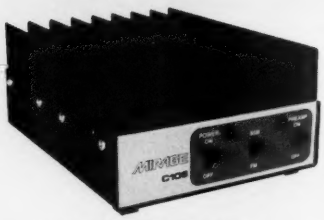

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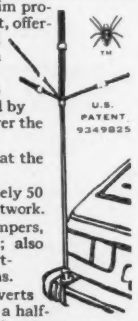

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tables are sold. Dealer setup at 9:30 am. Refreshments will be available. Talk-in on 146.19/.79 (SMART), and 146.52 and 29.500 simplex. For table reservations and tickets, send remittance and an SASE to Ham 10 FM Club of Kazoo, Ken Losey KA8RUA, 2825 Lake Street, Kalamazoo MI 49001.

BALTIMORE MD
OCT 23

The Columbia Amateur Radio Association will hold its 7th annual hamfest on Sunday, October 23, 1983, from 8:00 am to 3:30 pm, at the Howard County Fairgrounds, 15 miles west of Baltimore MD, just off I-70 on Rte. 144, 1 mile west of Rte. 32. Admission is $3.00. Indoor tailgating is $3.00 additional. Food will be available. Talk-in on 147.735/.135 and 146.52/.52. For table reservations and more information, write Ed Wallace K3EF, 9905 Carillon Drive, Ellicott City MD 21043.

GRAYSLAKE IL
OCT 29

The Civil Air Patrol, Waukegan Squadron, will hold its third annual hamfest on Saturday, October 29, 1983, from 0700 to 1700, at the Lake County Fairgrounds, Rtes. 45 and 120, Grayslake IL. Admission is $3.00 and tables are $5.00. There will be free parking and a large indoor heated flea market. Talk-in on 146.52. For reservations and more information, send an SASE to Civil Air Patrol, 637 Emerald Street, Mundelein IL 60060.

FRAMINGHAM MA
OCT 30

The Framingham Amateur Radio Association, Inc., will hold its 9th annual fall flea market on Sunday, October 30, 1983, in the Framingham Civic League Building, 214 Concord Street (Route 126), downtown Framingham MA. Admission is $2.00 and tables are $10.00 (pre-registration required). Sellers may begin setups at 8:30 am and doors will open at 10:00 am. There will be radio equipment, computer gear, and food in-house. Talk-in on .75/.15 and .52 direct. For more information, contact Ron Egalka K1YHM, 3 Driscoll Drive, Framingham MA 01701.

MARION OH
OCT 30

The Marion Amateur Radio Club will hold its 9th annual Heart of Ohio Ham Fiesta on Sunday, October 30, 1983, from 0800 to 1600 hours, at the Marion County Fairgrounds Coliseum, Marion OH. Tickets are $3.00 in advance and $4.00 at the door. Tables are $5.00. Food and a large parking area will be available. Talk-in on 146.52, 147.90/.30, and 223.34/224.94. For tickets, tables, information, contact Paul Kilzer W8GAX, 393 Pole Lane Road, Marion OH 43302; (617)-389-5573.

SATELLITES

STS-9 LAUNCH POSTPONED

NASA has announced that the shuttle mission carrying Dr. Owen Garriott W5LFL has been postponed by one month. The launch is now scheduled for Oct. 28 rather than the original date of Sept. 30.

According to the Westlink News Service, the launch has been delayed to give additional time for one of the shuttle data relay satellites to be prepared for the mission.

The satellite is an essential component in Spacelab, a series of experiments that will be conducted on board the shuttle *Columbia* during its mission. Although the satellite was launched during a previous shuttle flight, it was behind schedule in achieving the necessary geostationary orbit.

The ARRL has released the operating frequencies for Dr. Garriott's communications with earthbound hams. In North America, hams should listen for him on 145.550 and transmit on 20-kHz channels between 144.91 and 145.090 MHz.

OSCAR 10

Although no Mode L plans have been finalized, use of AMSAT OSCAR 10's Mode B (70 cm uplink, 2m downlink) was scheduled to begin Aug. 6. Unlike previous OSCARs, the new bird remains above the horizon for long periods of time, making reliable VHF/UHF DX possible for the first time in amateur radio.

The band plan for Mode B calls for the lower third of the downlink passband to be reserved for CW, the upper third to be used for SSB, and the center of the passband to be used by both CW and SSB operations. The band plan also reserved Special Service Channels for nets, bulletins, and other scheduled activities.

AMSAT recommends that stations use no more than 750-1000 W erp on the Mode B SSB uplink, and less than that will be necessary for successful CW operation. LSB is the agreed standard for SSB emissions, and right-hand circular polarization should be used for both Mode B and Mode L.

The elliptical orbit of AMSAT OSCAR 10 will also require different tracking techniques than were necessary for the near-circular orbits of previous OSCARs.

Unless specifically designed to include AO-10, run-of-the mill OSCAR locators and programs will not provide correct data for the new satellite. However, programs for many different computers are available from AMSAT for tracking AO-10. Write to AMSAT Headquarters, PO Box 27, Washington DC 20044, for more information.

Amateur Satellite Reference Orbits

Date		OSCAR 8 UTC	OSCAR 8 EQX	RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
Oct	1	0028	94	0015	89	0116	110	0055	127	0146	110	1
	2	0032	96	0010	89	0101	107	0045	126	0143	111	2
	3	0036	97	0004	89	0045	105	0035	125	0140	112	3
	4	0041	98	0159	119	0030	103	0026	124	0137	112	4
	5	0045	99	0153	119	0015	100	0016	123	0135	113	5
	6	0049	100	0148	120	0158	128	0007	122	0132	114	6
	7	0054	101	0142	120	0142	126	0156	151	0129	115	7
	8	0058	102	0137	120	0127	123	0146	151	0126	116	8
	9	0102	103	0132	120	0112	121	0137	150	0123	117	9
	10	0107	104	0126	120	0056	119	0127	149	0120	117	10
	11	0111	106	0121	120	0041	116	0117	148	0118	118	11
	12	0115	107	0116	121	0025	114	0108	147	0115	119	12
	13	0120	108	0110	121	0010	112	0058	146	0112	120	13
	14	0124	109	0105	121	0153	139	0048	145	0109	121	14
	15	0128	110	0100	121	0138	137	0039	144	0106	121	15
	16	0133	111	0054	121	0122	134	0029	143	0103	122	16
	17	0137	112	0049	122	0107	132	0020	143	0101	123	17
	18	0141	113	0044	122	0052	130	0010	142	0058	124	18
	19	0003	89	0038	122	0036	127	0000	141	0055	125	19
	20	0007	90	0033	122	0021	125	0150	170	0052	125	20
	21	0011	91	0028	122	0005	123	0140	169	0049	126	21
	22	0016	92	0022	123	0149	150	0130	168	0046	127	22
	23	0020	93	0017	123	0133	148	0121	167	0044	128	23
	24	0024	94	0012	123	0118	146	0111	166	0041	129	24
	25	0029	95	0006	123	0103	143	0101	165	0038	130	25
	26	0033	97	0001	123	0047	141	0052	164	0035	130	26
	27	0037	98	0155	154	0032	139	0042	164	0032	131	27
	28	0042	99	0150	154	0016	136	0033	163	0029	132	28
	29	0046	100	0144	154	0001	134	0023	162	0027	133	29
	30	0050	101	0139	154	0144	161	0013	161	0024	134	30
	31	0055	102	0134	154	0129	159	0004	160	0021	134	31
Nov	1	0059	103	0128	154	0113	157	0153	189	0018	135	1
	2	0103	104	0123	155	0058	154	0143	188	0015	136	2
	3	0108	105	0118	155	0043	152	0134	187	0012	137	3
	4	0112	107	0112	155	0027	150	0124	186	0010	138	4
	5	0116	108	0107	155	0012	147	0114	185	0007	139	5
	6	0121	109	0102	155	0155	175	0105	185	0004	139	6
	7	0125	110	0056	156	0140	173	0055	184	0001	140	7
	8	0129	111	0051	156	0124	170	0045	183	0158	171	8
	9	0134	112	0046	156	0109	168	0036	182	0155	172	9
	10	0138	113	0040	156	0053	166	0026	181	0152	173	10
	11	0142	114	0035	156	0038	163	0017	180	0149	174	11
	12	0003	90	0030	157	0023	161	0007	179	0147	174	12
	13	0008	91	0024	157	0007	159	0156	208	0144	175	13
	14	0012	92	0019	157	0150	186	0147	207	0141	176	14

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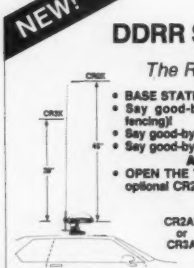

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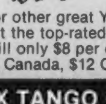

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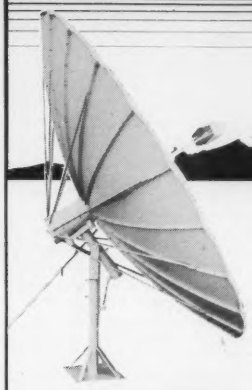

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↙See List of Advertisers on page 114

CONTESTS

Robert Baker WB2GFE
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VK/ZL/OCEANIA DX CONTEST

Phone
Starts: 1000 GMT October 1
Ends: 1000 GMT October 2

CW
Starts: 1000 GMT October 8
Ends: 1000 GMT October 9

Sponsored by WIA and NZART, the National Amateur Associations in Australia and New Zealand. Use all amateur bands (but no crossband operation is permitted). Only one contact on CW and one contact on phone per band is permitted with any one station for scoring purposes. Only one amateur is to operate any one station under the owner's callsign. Should two or more operate any particular station, each will be considered a competitor and must submit a separate log under his own callsign. This is not applicable to overseas competitors operating club stations.

EXCHANGE:

Send 5 or 6 digits made up from the RS(T) report plus a three-digit QSO number starting with 001. Exchange must be acknowledged before points can be claimed.

SCORING:

Stations outside VK/ZL score 2 points per QSO on a specific band with VK/ZL stations. Single-band score will be QSO points for that band multiplied by total VK/ZL call areas worked on that band. Allband score will be total QSO points for all bands multiplied by the total VK/ZL call areas worked on all bands.

AWARDS:

Certificates will be awarded the top scorers in each country (each call area in USA, USSR, and Japan). Depending on reasonable degree of activity, separate awards may be made for top scorers on different bands.

ENTRIES:

Logs must show information in this order: date/time in GMT, callsign of station contacted, band, serial number sent, and serial number received. Underline each NEW VK/ZL call area contacted and make a separate log for each band used. Include a summary sheet to show: callsign, name and address (*please use block letters!*), details of equipment used and, for each band, QSO points for that band and total VK/ZL call areas worked on that band. Failure to remove duplicate contacts will incur heavy penalties, and greater than 2% duplicates will disqualify the entry.

All logs should be posted to: WIA VK/ZL Contest Manager VK3BGW, 1 Noorabil Court, Greensborough, Victoria 3088, Australia. Any logs, even for small numbers of contacts, will be greatly appreciated!

SWL SECTION:

The rules are similar to the transmitting section but it is open to all members of any SWL society in the world. No transmitting station is permitted to enter this section. The contest times and logging of stations on each band per weekend are as for the transmitting section except that the same station may be logged twice on any band, once on phone and on CW.

To count for points, the station heard must be in QSO exchanging data in the VK/ZL DX contest and the following details noted—date/time in GMT, call of the station heard, call of the station he is working, RS(T) of the station heard, serial number sent by the station heard, band, points claimed. Scoring is on the same basis as for the transmitting section and a summary sheet should be similarly set out.

Overseas stations may log only VK/ZL stations, but VK receiving stations may log overseas stations and ZL stations, while ZL receiving stations may log overseas and VK stations. Certificates will be awarded as listed in the section under awards.

Beaver County QRM

NEWSLETTER OF THE MONTH

Beneath the full masthead of this newsletter (part of which is above), if you look closely, you can make out the words "Founded: 1922." Here's a club with history, and the members of the Beaver Valley Amateur Radio Association have not forgotten their spark-gap roots.

The *Beaver County QRM*, edited by Joseph Ross KF3X, is a newsletter the club's founders could be proud of. Editor Ross ensures that the newsletter does not merely inform but entertains as well, and part of his editorial repertoire stems from the club's long history. Features such as "Club Capsule," which reincarnates the news of 40 years ago, remind members of their heritage.

The June issue also included a reprint of minutes from the club's 11-member reorganizational meeting in 1946. Less than 10 years later, the club incorporated, evidence of its strong post-war growth.

Ross does not limit the *QRM* to Beaver Valley club news only. Through the newsletter, he keeps members up to date on other news, too—such as an interview with ARRL Atlantic Division Director Hugh Turnbull on volunteer exams and no-code licenses. He also culls the best from other newsletters, such as the Indiana County ARC's *Sine of the Times* and the Triple States Radio Amateur Club's *BNT*, and reprints them in the *QRM*. And for those whose interests fall in areas outside of ham radio, Ross has thoughtfully included some interesting no-ham features. "If You Are A Beer Drinker and Like to Keep Your Weight Down" is (or should be) of particular interest to the summertime ham.

So if you want to know not only the latest FCC regs or satellite news, but also the number of calories in 807 Ale—*Beaver County QRM* is for you

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send a copy to *73*, Pine Street, Peterborough NH 03458.

CALIFORNIA QSO PARTY
Starts: 1600 GMT October 1
Ends: 2159 GMT October 2

Sponsored by the Northern California Contest Club, with strong efforts being made to have all 58 counties in California on for the contest duration.

Single-operator stations may operate only 24 hours of the contest period; off times must be clearly marked in the log and must be at least 15 minutes long. Multi-operator stations may operate the full 30 hours. Stations may be worked only once per mode per band. All contacts must be simplex. All CW contacts must be made in the CW subband. California stations that change counties are considered to be new stations and may be contacted again for points credit.

EXCHANGE:

CA stations send QSO number and county. Others send QSO number and state, province, or ARRL country.

FREQUENCIES:

Novice—3725, 7125, 21125, 28125.

CW—1805, 3560, 7060, 14060, 21060, 28060.

SSB—1815, 3895, 7230, 14280, 21365, 28560.

Try CW on the half-hour and 160 meters at 0500.

SCORING:

Each completed phone contact is worth 2 QSO points. Each completed CW contact is worth 3 QSO points. For multiplier, CA stations use the number of states, VO/VE 1–7, and VY1/VE8 for a possible of 58. Others use the number of CA counties worked for a possible total of 58. The final score is the number of QSO points multiplied by the total number of multipliers.

AWARDS:

Certificates for highest scoring station in each CA county, each state/province, and each country. Certificates also to each station scoring 100 or more QSOs. Trophies to the highest scoring out-of-state single op, highest scoring CA single op, and highest scoring DXpedition to a CA county by single and multi-ops.

ENTRIES:

All logs and summary sheets must be sent by November 1 to: NCCC, c/o Alan Brubaker K6XO, 34456 Colville Place, Fremont CA 94536. Please include a business-size SASE with your entry.

QSLS:

QSLs to NCCC California stations without an SASE will be responded to via the QSL Service (USQS), PO Box 814, Mulino OR 97042. This will enable CA stations to confirm contest QSOs at minimum expense to all concerned. To claim these and other QSLs from USQS, send a business-size SASE to USQS. For further details, send an SASE to USQS or see any issue of *World Radio News*.

OREGON QSO PARTY
1700 GMT October 1 to
0800 GMT October 2
1500 GMT October 2 to
0000 GMT October 3

Sponsored by the Hermiston Amateur Radio Club. Operating categories include mixed mode or CW only. Each station may be worked once per band and once per mode.

CALENDAR

Oct 1–2	**California QSO Party**
Oct 1–2	**VK/ZL/Oceania Contest—Phone**
Oct 1–3	**Oregon QSO Party**
Oct 8–9	**ARRL QSO Party—CW**
Oct 8–9	**VK/ZL/Oceania Contest—CW**
Oct 9–10	**ARRL QSO Party—Phone**
Oct 15–16	**ARRL Simulated Emergency Test**
Oct 15–16	**Maryland-DC QSO Party**
Oct 15–16	**Scout Jamboree On The Air**
Oct 22–23	**MF Runde SW Activity Weekend**
Oct 22–23	**Clara Ac-Dc Contest**
Oct 22–23	**QRP ARCI Fall QSO Party**
Oct 22–23	**Pennsylvania QSO Party**
Nov 5–6	**ARRL Sweepstakes—CW**
Nov 6	**DARC Corona 10-Meter RTTY Contest**
Nov 19–20	**ARRL Sweepstakes—Phone**
Dec 3–4	**ARRL 160-Meter Contest**
Dec 10–11	**ARRL 10-Meter Contest**
Feb 4–5	**South Carolina QSO Party**
Feb 18–19	**America Radio Club International DX Contest**

RESULTS

1982 MARYLAND-DC QSO PARTY

Non-Maryland Stations

Callsign	QSO	Mult.	Score	Power	Mode	State/ Country
W5WG	58	17	*1479	A	CW/SSB	LA
VE3KK	57	17	*1454	A	CW/SSB	Canada
KS8Q	46	15	1035	A	CW/SSB	MI
K4DDB	45	12	*774	A	CW	FL
W8WVU	32	15	720	A	CW/SSB	MI
K1BV	35	12	630	A	CW/SSB	CT
KE5B	28	14	*588	A	CW	AR
KM0A	28	14	588	A	CW	MO
W3EFY	25	13	488	A	CW/SSB	PA
N9AUZ	20	14	420	A	CW	IL
AD5F	25	11	413	A	CW	TX
AG5C	33	8	369	A	CW/SSB	TX
W8YL	17	14	357	A	CW	MI
W8EAO	23	9	311	A	CW(QRP)	OH
WB2IPX	22	9	297	A	CW	NY
WA3UNX	13	8	216	A	CW/SSB	PA
WD4SIG	13	11	215	A	CW	TN
W5NR	17	12	204	B	CW	TX
KV0E	13	10	195	A	CW	CO
K3WGR	16	7	168	A	CW/SSB	PA
W8VEN	13	10	*130	B	SSB	WV
WA2UDT	13	8	104	B	CW/SSB	NJ
VO1AW	17	6	102	B	CW	Canada
WA3JXW	13	7	91	B	CW/SSB	PA
WB9HGS	8	6	72	A	CW/SSB	WI
ON7YU	9	6	*71	A	SSB	Belgium
KA8IIN	6	5	45	A	CW/SSB	MI
N0CLV	6	3	27	A	CW/SSB	KS
KD4PP	4	4	24	A	CW	TN

Maryland-DC Stations (County)

WA3VYQ	620	92	*57040	B	SSB	Howard
K3WUW	306	74	*33966	A	CW/SSB	Prince Geo.
N3AC	248	41	*15252	A	CW	Mobile(1)
W3FG	182	51	*13923	A	CW	Anne Arundel
N3QA	153	46	10557	A	CW	Queen Anne
K3LK	211	30	9495	A	CW	Mobile(2)
W3GG	174	44	7656	B	CW	Montgomery
WB3JKC	98	38	5586	a	SSB	Baltimore City
WB3HUP	138	25	5175	A	SSB	Mobile(3)
KA3JLW	24	17	617	A	CW	Montgomery

(1) N3AC was mobile in Anne Arundel, Calvert, Caroline, Charles, Dorchester, Howard, Prince Georges, Queen Anne, St. Mary's, Talbot, Wicomico.

(2) K3LK was mobile in Montgomery, Prince Georges, Howard, Baltimore, Baltimore City, Hartford, Cecil, Kent, Queen Anne, Caroline, Talbot, Dorchester, Wicomico, Somerset.

(3) WB3HUP was mobile in Calvert, Charles, St. Mary's, Prince Georges, Washington, DC, Montgomery, Howard, Anne Arundel, Talbot, Dorchester, Wicomico, Somerset, Worcester, Caroline, Kent, Cecil.

Power: (A) 200 Watts or less input; (B) > 200 Watts input.

*: Certificate winners.

EXCHANGE:

Signal report and state, province, country, or OR county.

FREQUENCIES:

Phone—1810, 3929, 7260, 14300, 21370, 28600.

CW—60 kHz up from bottom of each band.

Novice—10 kHz up from bottom of each Novice band.

SCORING:

Count one point per QSO. OR stations multiply QSO points by the sum of states, provinces, countries, and OR counties. All others multiply by the sum of OR counties worked (36 max).

ENTRIES AND AWARDS:

All entries must have a log and summary sheet. Official sheets are available from KA7IXH for an SASE. Logs must be received by November 4 and should be addressed to Bob Franklin KA7IXH, Rt. 3, Box 3783, Hermiston OR 97838. Include a large SASE for a copy of the results.

MARYLAND-DISTRICT OF COLUMBIA QSO PARTY
Starts: 1800 GMT October 15
Ends: 2100 GMT October 16

Sponsored by the Columbia Amateur Radio Association, the contest is open to all single-operator stations. The same station may be worked on each band and mode.

EXCHANGE:

QSO number, RS(T), and state, province, country, or MD county. Remember

RESULTS

1983 SPRING CONTEST— BRITISH AMATEUR RADIO TELEPRINTER GROUP

Single Operator

Callsign	Points	QSOs
ON4UN	716690	365
YU7AM	341736	276
I1HUH	339600	226
DJ6JC	289100	187
Y25DL	288696	197
YB2BLI	280578	164
HB9AAA	280200	161
SM6ASD	270940	197
W3FV	243212	179
W2IUC	225792	201
GI4AHP	223380	206
YO2IS	211684	201
KB2VO	195506	158
I4JXE	182188	151
VK2SG	167570	158
I0UIQ	164604	167
I8JRA	159510	132
K4AGC	158796	147
GM3ZXL	158148	130
W3FIZ	154100	118
I0ZSG	142400	166
WB3HAZ	141858	108
UT5RP	137350	215
ON7EP	133080	105
DL9MBZ	131216	113
K0JH	126852	121
9M2CR	121968	121
K6WZ	119048	142
WD5ELJ	118320	156
JA2VFW	109300	101
GW3EHN	103000	106
W6JOX	101332	118
G4NYO	96000	84
JR2CFD	94188	79
JR2TZL	92610	93
SM5BKA	91800	74
I0WQP	88920	127
OK2SPS	88896	106
VE2AXO	87710	99
LA7AJ	86940	74
OH8TA	82560	148
VK1GM	74400	86
JA1BYL	73800	72
VK2BQS	72068	80
DK1BX	71516	69
SM5FUG	70684	74
OH2BDN	69156	125
DK9CK	66144	52
KB9DM	62968	66
PY2ERA	61440	100
DL8QP	60420	63
WB4UED	60104	63
SM7LSU	59544	67
PY6ACP	56440	70
DF9XI	56364	87
WB3IGR	56160	44
VE8CM	55020	78
OK1MP	53690	36
N7AKQ	50928	113
OK1AWC	48112	58
VE7VP	47740	54
W2KHQ	45954	65
ON6ZM	45760	56
SM7ABL	42630	47
YU2CB	41664	51
DF5BX	39234	67
JR6AG	38976	45
WA6WGL	38760	50
WA3ZKZ	37590	49
Y37UF	36120	42
G4MKO	32660	42
SM6AEN	32344	46
G4NJW	30144	28
XT2AU	28130	37
W3AOH	27360	34
OZ1GRF	26180	39
IK1AAW	25200	26
JH2PDS	24886	29
DJ8WCY/P	22288	47
SM7BGE	22088	42
OH5YW	21630	23
DL3YBU	20480	24
F3IJ	19418	23
YO6FR	16942	71
JF2PZH	16768	32
W7CBY	16586	33
Y55ZF	14490	33
SM0BYD/7	14436	21
PY6SL	13468	17
G3RDG	12996	30
TI2DO	12900	26
ON7EU	12492	31
Y53VA	12236	34
Y71SH	10008	39
K2TY	8736	24
YO2AC	7548	26
PY2FWX	5808	14
F3PI	4928	16
SM5AAY	4860	14
HA6VX	2512	13
OK3TZL	1596	9
W8TCO	720	4
Y59ZF	672	4

Multiple Operator

Callsign	Points	QSOs
LZ1KDP	441604	274
OH2AA	413996	310
G3ZRS	378566	249
LZ2KRR	310460	246
GW4RDO	182700	141
OK1RJB	159256	119
G4ALE	156996	118
HA5KBM	133052	131
HA6KVD	102700	107
OK3KJF	92312	114
KD4RT	73950	73
OK3KGI	69888	112
G4LLR/A	63900	86
KL7RS	25116	50
Y83KMF	20256	33
SM6LTO	5408	24

Short Wave Listener Section

Callsign	Country	Points	QSOs
ONL-5566	Belgium	354348	233
OZ-DR 2135	Denmark	312984	221
I1-053GE	Italy	261096	175
NL-4483	The Netherlands	194668	119
John Mathews	United States	111936	92
OK2-21478	Czechoslovakia	95900	170
FE-3700	France	66290	71
Y2-19600/A	German Dem. Rep.	51768	67
BRS 31976	England	32214	35
FE-1107	France	27432	44

RESULTS

1982 CAN-AM CONTEST

Trophy Winners

Canadian champion, combined	VE6OU, John Sluymer
American champion, combined	AA5B, Bruce Draper
Canadian phone trophy	VE5ADA, B.J. Madsen
American phone champion	AH6BK, Mike Hart
Canadian CW trophy	VE3DZV, Ken Dixon
American CW champion	K6LL/7, David Hachadorian
Canadian multi-op champion	VE7ZZZ, Prince George CC
American multi-op champion	N5FA/6, Harvey Mudd College RC
Club competition	Albuquerque DX Assn.

Single Operator

Canadians		Americans	
Combined Phone and CW			
VE6OU	**1026997**	**AA5B**	**743589**
VE3DZV	163404	W5JW	729008
VE1CEG	123574	AH6BK	722127
VE3ATD	115830	AG7M	527828
VE5ADA	100772	K6HNZ	424732
VE3NBE	60462	K6LL/7	344768
VE3FHZ	26390	KB5FU	314768
VE3KOY	19147	KJ7K	294168
VE3BMY	18966	KF6A	277580
VE7IQ	16653	KB0G	223295
Phone			
VE6OU	631410	AH6BK	536089
VE5ADA	100772	AA5B	485415
VE3FHZ	26390	K6HNZ	424732
VE7EGD	15480	W5JW	387121
VO1QU	13792	KJ7K	294168
VE3BMV	9231	AG7M	288788
VE3CKR	7020	KB5FU	274988
VE7DKS	5859	KF6A	158330
VY1DD	1260	KU5I	100737
VE4AKN	1258	KC7JO	91304
CW			
VE6OU	394956	K6LL/7	344770
VE3DZV	163404	W5JW	341887
VE1CEG	123574	AA5B	258174
VE3ATD	115830	AG7M	239040
VE3NBE	60270	KB0G	223295
VE3CKR	53658	KG5U	216216
VE3KOY	19147	AH6BK	186038
VE7IQ	16653	KQ8M/0	128202
VE3KZE	12578	KF6A	119250
VE3MKK	10170	W7TC	100512
Multi-Operator, Combined Phone and CW			
VE7ZZZ	666510	N5FA/6	917856
VE1DXA	484530	K5LZO	314689
VE5GF	315341	KO8T	360458

Club Competition

Albuquerque DX Assn.	2443049
Northern Alberta CC	1026366
Texas DX Society	946410
River City Contesters	329004
Sturdy Mem. Hospital ARC	147912

that Baltimore and Washington are independent cities!

SCORING:

MDC stations multiply total QSOs by sum of MD counties, states, provinces, and countries. Others multiply MDC QSO total by number of MD counties and independent cities (25 maximum). Also, multiply score by 1.5 if running 200 Watts or less.

FREQUENCIES:

Phone—3950, 7250, 14290, 21390, 28590.

CW—60 kHz up from low end.

Novice—3720, 7120, 21120, 28120.

AWARDS AND ENTRIES:

Maintain a continuous log for phone and CW but indicate on entry which category (phone, CW, or mixed) you are entering. Certificates for top scorers in each category will be awarded. Mail logs, dupesheets (for over 200 contacts) and summary by November 30th to CARA, c/o Robert K. Nauman WA3VUQ, 4017 Font Hill Drive, Ellicott City MD 21043.

MINNESOTA QSO PARTY
1800 to 2300 GMT October 15

Sponsored by the Paul Bunyan Wireless Association. Work stations once per band and mode. Repeater QSOs are not allowed.

FREQUENCIES:

Phone—3890, 7230, 14280, 21375, and 28675.

CW—40 kHz up from low end of the band.

Novice—25 kHz from the low end of the band.

EXCHANGE:

Exchange signal report and QTH (county for Minnesota stations; state, province, or country for others).

SCORING:

Count 1 point for each phone QSO and 2 points for each CW QSO. MN stations multiply total QSO points by the sum of the number of states worked. Other stations multiply by the total of Minnesota counties worked (maximum, 86). Add 100 bonus points if you work 10 Minnesota counties.

ENTRIES:

Entries must be mailed no later than November 1, 1983, to PBWA, Steve Scott KC0UJ, 801 6th St., Staples MN 56479.

JAMBOREE ON THE AIR
Starts: 0001 GMT October 16
Ends: 2400 GMT October 17

This is the 26th annual Scouting/ham radio event sponsored by the World Scout Bureau, Geneva, Switzerland. Boy Scouts and Girl Scouts of all ages, from Tiger Cubs through adult Scouters, and anyone interested in Scouting and ham radio are welcome. If you have never been a Scout, talk to some Scouts about amateur radio and give them the thrill of talking to you. There should be activity from about 100 countries, just enough for DXCC! The World Bureau station, HB9S, the BSA station, K2BSA, and many camporee and special-event stations will also be operating.

The exchange is just good Scout talk about Scouting experiences, ham radio, and friendship greetings, many of which may lead to lasting pen-pal exchanges.

FREQUENCIES:

Scout frequencies published by the World Bureau are as follows:

Phone—3940, 7290, 14290, 21360, 28990.

CW—3590, 7030, 14070, 21140, 28190.

Novice—SSTV and RTTY on usual frequencies.

Postcard-size certificates issued by the World Bureau are available to anyone participating in any manner. Send SASE to: Boy Scouts of America, International Division/JOTA Cards, 1325 Walnut Hill Lane, Irving TX 75062-1296 (twenty cents affixed postage for up to 8 cards and 17 cents for each additional 8 cards). Cards/certificates may be ordered before the event for distribution during JOTA activities or after.

A distinctive temporary insignia pocket patch is available for the first time, for wear on the Scout uniform, at $1.00 per patch, postpaid, any quantity. Send personal check or money order (no stamps) to BSA, International Division/JOTA PATCH, at the same address as above. Checks should be made out to: Boy Scouts of America. Please send *separate* orders for certificates and patches.

Logs or lists of participants are *not required*, but reports of activity, news articles, bulletin announcements, narrative reports of activity, and photos are welcome for inclusion in the BSA report to the World Bureau and possible use in Scout publications. Send them to the JOTA Coordinator W2GND, 216 Maxwell Avenue, Hightstown NJ 08520.

PENNSYLVANIA QSO PARTY
1600 GMT October 22
to 0500 GMT October 23
1300 GMT October 23
to 2200 GMT October 23

Sponsored by the Nittany Amateur Radio Club. CW contacts must be in the CW subbands. Stations may be worked once per mode (phone and CW) on each band. Mobiles may be reworked as they change counties. Repeater contacts are not permitted.

There are four classes of entry: single operator with no assistance allowed, fully mobile (multi-op OK), multi-operator with single transmitter and no spotting receivers, and multi-multi where anything goes.

EXCHANGE:

RS(T), 3-digit sequential serial number, and ARRL section or PA county. Stations on county lines will give out one number but the two counties will count as two separate multipliers.

FREQUENCIES:

SSB—3980, 7280, 14280, 21380, 28580.

CW—40 kHz up from bottom of CW bands.

Novice—10 kHz up from bottom of Novice subbands.

Try 160 meters CW on 1810 at 0400 GMT and SSB on 1835. New WARC bands are not permitted.

SCORING:

Count 1 point for SSB QSOs, 1.5 points for CW QSOs, and 2 points for 160- and 80-meter CW QSOs. PA stations multiply QSO points by the total number of ARRL sections plus the total number of PA counties plus a maximum of one DX country (142, total maximum). Others, multiply QSO points by the total number of PA counties worked (67, maximum).

AWARDS:

Plaques for top scorers in both eastern and western PA, top out-of-state station, top mobile station (assuming at least 3 entries), and top multi-operator entry. Revolving trophy to the club with the top aggregate score from membership. Certificates to winner in each county, each section with a minimum of 20 QSOs, and winner in each club with a minimum of 3 entries.

Special awards to the first station which scores 150,000 points (single operator), 2,000 QSOs (any class), 200,000 points (multi-single), 500 QSOs (out of state), 1,000,000 points (club competition), and all the 67 counties in the contest.

ENTRIES:

Logs must be submitted on official forms or on reasonable duplicate. Also include a dupesheet for entries with over 100 QSOs. For each dupe QSO removed by checkers 100 points will be deducted from your final score. Illegible logs will be treated as check logs. Send logs no later than November 25 to Douglas R. Maddox W3HDH, 1187 S. Garner Street, State College PA 16801. Note: Please include $0.50 postage for results!

QRP ARCI
FALL QSO PARTY
Starts: 1200 GMT October 22
Ends: 2400 GMT October 23

The contest is open to all amateurs and all are eligible for the awards. Stations may be worked once per band and mode for QSO and multiplier credits. Partici-

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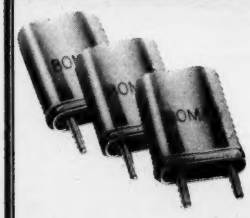

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3395 kHz FILTER BANDWIDTHS IN STOCK

CW: 250 and 400Hz. SSB: 1.8 and 2.1 kHz . . . . . $60 each

For newer models like the **TS130, TS430, TS530, TS830, TS930, and R820,** FOX TANGO is the sole source of superior 8-pole discrete-crystal substitutes for the smaller YF-88 Monolithic and CF-455 ceramic units. Since they are larger in size, the FOX TANGO filters must be patched into the circuit with coax but all needed materials and detailed instructions are included in the price of the filters; no drilling is required. All have an 8830 kHz center frequency (CW 8830.7 except TS930)

8830 kHz FILTER BANDWIDTH IN STOCK

CW: 250 and 400 Hz. SSB: 1.8 and 2.1 kHz. AM: 6.0 kHZ . . . . . $60 each

The more sophisticated **TS830, TS930, and R820** use the above 8830 filters *plus 455 kHz units for their final intermediate frequency (CW455.7 except TS930).*

455 kHz FILTER BANDWIDTHS IN STOCK

CW: 400 Hz. SSB: 2100 kHz. Price reduced. Now only $110 each. Replacing (or supplementing) *both* 8830 and 455 kHz original filters with a ***matched-pair*** of FOX TANGO discrete-crystal SSB units results in a dramatic improvement of selectivity in both SSB and CW! Indeed, the VBT is so effective at narrow frequencies that separate CW filters are needed *by only the most dedicated CW operators.* For a detailed report send an SASE for a free reprint of a three-page article from "73" magazine and comparative characteristic curves.

FILTER CASCADING KITS

The TS830, TS930, and R820 owe their exceptional selectivity (with superior filters) to the fact that i-f signals must pass through two filters with 16 poles of filtering. Essentially the same effect can be achieved in the other sets by adding an additional 8-pole FOX TANGO SSB filter and a board for impedance matching and insertion-loss compensation. This is known as Filter Cascading and FOX TANGO kits include a recommended 2.1 kHz filter (1.8 optional) and all needed parts and instructions; wired and tested, ready for easy installation.

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ORDERING INSTRUCTIONS: *Specify* the **MODEL** in which the filter(s) or kit(s) is to be used and the filter **bandwidth and frequency** desired. Order by mail or telephone. We accept VISA/MC or ship COD. Add for shipping: $3 (COD $1 extra), Airmail $5, Overseas $10.

DISCOUNTS:

Deduct 10% from the price of *two or more filters* ordered at the same time and sent to the same address (such as a 2.1 kHz) matched pair for TS830: ($60 + 110) − $17 = $153 + shipping). Discounts do not apply to cascading kits unless two or more are ordered. ✓88

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pants may operate a maximum of 24 hours during the contest period.

EXCHANGE:

Members—RS(T), state, province, or country, and QRP ARCI membership number.

Non-members—RS(T), state, province, or country, power output.

SCORING:

Each member QSO counts 5 points regardless of location. Non-member QSOs are 2 points with US and Canadian stations; others, 4 points each. Multipliers are as follows: 4–5 Watts output CW or 8–10 Watts output PEP— × 2, 3–4 Watts output CW or 6–8 Watts output PEP— × 4, 2–3 Watts output CW or 4–6 Watts output PEP— × 6, 1–2 Watts output CW or 2–4 Watts output PEP— × 8, and less than 1 Watt CW or 2 Watts output PEP— × 10.

Entries from stations running more than 5 Watts output CW or 10 Watts output PEP will count as check logs only. Stations are eligible for the following bonus multipliers: If 100% natural power (solar, wind, etc.) with no storage— × 2; if 100% battery power— × 1.5.

Final score is total QSO points (total all bands) times total number of states, provinces, or countries times the power multiplier and times the bonus multiplier, if any.

FREQUENCIES:

CW—1810, 3560, 7040, 14060, 21060, 28060, 50385.

SSB—1810, 3985, 7285, 14285, 21385, 28885, 50385.

Novice/Tech—3710, 7110, 2110, 28110.

No 30-meter contacts will be counted.

AWARDS:

Certificates to the highest-scoring station in each state, province, or country with 2 or more entries. Entries automatically considered for annual Triple Crowns of QRP Awards.

LOGS AND ENTRIES:

Separate log sheets are suggested for each band for ease of scoring. Send full log data plus separate worksheet showing details and time(s) off the air. No log copies will be returned. All entries desiring results and scores please enclose a business-size envelope with return postage for one ounce or an IRC.

It is a condition of entry that the decision of the QRP ARCI Contest Chairman is final in case of dispute. Logs must be received by November 20th to qualify. Logs received after that date or missing information will be used as check logs. Send all logs and data to William W. Dickeron WA2JOC, QRP ARCI Contest Chairman, 230 Mill Street, Danville PA 17821.

CLARA AC-DC CONTEST
Starts: 1800 GMT October 22
Ends: 1800 GMT October 23

Sponsored by the Canadian Ladies Amateur Radio Association, the Ac-Dc Contest is open to all YL and OM amateurs. Each station may be worked twice, either once on CW and once on phone, or on two different bands.

EXCHANGE:

Signal reports, QTH, and name. Bonus stations will operate in each province and will identify!

FREQUENCIES:

Phone—3900, 3775, 7150, 14280, 14160, 21300, 28588, 28488.

CW—3690, 7035, 14035, 21035, 28035.

SCORING:

CLARA members score 1 point per contact with non-members, 2 points per CLARA member contact, and 3 points per bonus station. Multiply by two for contacts made on CW. Multiply total of the above by the number of Canadian provinces/territories worked for total score. Non-CLARA members count points the same except only CLARA member contacts are to be counted.

AWARDS:

First place, CLARA Cup, and certificate to first-place CLARA winner, certificates to second and third. Plaque and certificate to first-place non-CLARA winner, certificates to second and third.

ENTRIES:

All logs submitted are eligible for the mini-prize drawing. Mail all logs and scores with your name, call, address, and postal code by December 15th to Muriel Foisy VE3LQH, Box 122, Janetville, Ontario, Canada L0B 1K0.

MF RUNDE SW ACTIVITY WEEKEND
Starts: 0400 GMT October 22
Ends: 2200 GMT October 23

The society of hamming ex-naval radio operators (MF Runde) offers this SW activity weekend for the easier application of the society awards. Every licensed ham is invited to take part, but QSOs must be between MF members and non-members. No club stations are permitted—only single-operator stations. Use all bands except the new WARC 10-, 18-, and 24.9-MHz bands, using CW and/or SSB.

This is the second weekend of activity. The official rules were received too late to publish before the first weekend in April.

The society club stations, DL0MF and DL0MF/A, are coordinating the traffic: Every full hour they pile up competitors (MF members and non-members) on SSB and divert them to frequencies where MF members are QRV for QSOs. Every 30 minutes after the hour they do the same thing with CW competitors. The advantage is that the club stations are able to tell competitors what MF members within the next hour are QRV. Every 3 hours the working frequencies are changed. General call for all is "CQ MF."

EXCHANGE:

RS(T) for non-members, RS(T) and MF number for members.

SCORING:

Every MF member worked on CW counts 2 points; on SSB, 1 point. QSOs with DL0MF on CW are 10 points or 5 points on SSB. QSOs with DK0MG and DK0DW are 6 points on CW and 3 points on SSB. Remember that every MF member can be worked on SSB and CW; that means 3 points for both contacts! Final score is the sum of QSO points.

AWARDS:

Awards are issued for 50 points (bronze), 100 points (silver), 150 points (gold), and 250 points (trophy). Awards for CW-only operation will have special engraving! For further information on award rules and MF membership lists, please send addressed envelope and IRCs to award manager.

ENTRIES:

Every operator is asked to send his signed logs no later than November 15th to Kurt Wuestner, Award Manager, PO Box 25, D-4600 Dortmund, Federal Republic of Germany. Award applicants outside the Federal Republic should use a GCR list and add 20 Deutschmark in cash or equivalent value. Logs must show call-sign, name, and home address, plus date/time in GMT, band, station worked, and exchanges sent and received.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

HELVETIA 26 AWARD

This award has been instituted by the Union of Swiss Short Wave Amateurs (USKA) with the object of furthering friendly relations and the competitive spirit between its members and radio amateurs abroad.

Foreign amateurs must submit QSL cards showing evidence of contacts with stations in each of the 26 cantons and half-cantons of the Swiss Confederation on any bands between 1.8 and 30 MHz.

All contacts claimed must be made on or after January 1, 1979. Cross-mode contacts will not be valid. Awards will be offered for all phone, all CW, phone/CW mixed mode, radioteletype (RTTY), and slow-scan television (SSTV).

QSL cards submitted must clearly show the location (canton) of the Swiss station at the time of contact. Any QSL card from a Swiss station operating from a temporary or portable location at the time of the contact must show the canton of such location in order to be recognized as a valid contact.

In addition to QSL cards, applicant must submit a signed list of all contacts in alphabetical order by canton, include the station's callsign, date and time in GMT, band and mode of operation, and RS(T).

The 26 cantons are as follows: AG—Aargau, AI—Appenzell Inner Rhoden, AR—Appenzell Outer Rhoden, BE—Berne, BL—Basel Country, BS—Basel City, FR—Fribourg, GE—Geneva, GL—Glarus, GR—Grisons, JU—Jura, LU—Lucerne, NE—Neuchatel, NW—Nidwalden, OW—Obwalden, SG—Saint Gall, SH—Schaffhausen, SO—Solothurn, SZ—Schwyz, TG—Thurgau, TI—Ticino, UR—Uri, VD—Vaud, VS—Valais, ZG—Zug, ZH—Zurich.

The applications for the award must have sufficient postage enclosed in the form of IRCs to allow the safe return of your QSL cards.

Mail your application to the attention of Walter Blattner HB9ALF, PO Box 450, 6601 Locarno, Switzerland.

STATE CAPITALS AWARD

The Newark News Radio Club of Newark, New Jersey, takes pleasure in announcing its sponsorship of the SCA (State Capitals Award), which is available to licensed amateurs throughout the world for working stations located in state capital cities of the United States on or after January 1, 1960. This award is also available to shortwave listeners on a "heard" basis.

The purpose of this award is to offer recognition for operating achievements and to offer still another worthwhile contribution to the field of competitive radio-amateur operation.

It is hoped by the directors, officers, and members of NNRC that amateurs everywhere will accept the award as a gesture on the part of the sponsor to further promote and expand goodwill and better understanding among amateur operators and shortwave listeners.

The State Capitals Award is offered in three (3) classes: Class C—work 30 state capital cities; Class B—work 40 state capital cities; Class A—work 50 state capital cities.

There are no band or mode endorsements. Cross-mode contacts will not be valid.

To apply, applicants should prepare a list of contacts claimed, listing them in alphabetical order by US state. Include the usual logbook information for each contact. Have this list verified locally by two amateurs, a local radio club secretary, or a notary public. Do not send QSL cards. Have your verified list sent along with the $1.00 award fee to S. J. Knox WB2MRA, 212 North Jerome Avenue, Margate, New Jersey 08402.

DIPLOME DES 100

This award is given by the ITU to radio amateurs and shortwave listeners everywhere in recognition of their achievement in communicating with, or logging the reception of, amateur-radio stations in the territory of 100 or more member administrations of the ITU. Any licensed radio amateur or shortwave listener is eligible for this award. It is given to the individual, and the qualifying contacts may be made over any period of time subsequent to the dates shown in the ITU official countries list available from the awards manager.

Applications shall be made by letter and shall include a list of stations claimed in alphabetical order, showing claimed dates. No special form is required for this purpose. Only frequencies, modes, and prefixes approved by the Radio Regulations of the ITU may be used. To qualify, 100 or more contacts must be made.

QSL cards or proper log entries will be considered proof of contact to back up an award application. Attached to the application should be a statement from two licensed amateurs or an ITU administration representative to the effect that all claimed contacts have been verified. No other proof is required. Do not send QSL cards! Do not send logs!

There will be no endorsements for special conditions. Stickers will be given for each ten (10) additional contacts.

The administration of this award has been delegated to the International Amateur Radio Club, 4U1ITU, PO Box 6, 1211 Geneva 20, Switzerland. The IARC has

named Mr. L.M. Rundlett K4ZA as awards manager. All applications should be accompanied by 10 IRCs or US $2.00 for the award, and one IRC or a US self-addressed, stamped envelope for each sticker. Mail all applications to L.M. Rundlett K4ZA, Route 3, Box 447, Lake Placid FL 33852.

AWARDS FROM MOSCOW

I received a very complete package of information from the Central Radio Club in Moscow and take pleasure in featuring their award program in more detail. It is unfortunate they did not send samples of their certificates, as I'm sure they are unique diplomas to possess.

R-100-0 Award

This award (as is the case for all awards listed below) is issued to all licensed radio amateurs and shortwave listeners throughout the world who can meet the requirements. For the R-100-0, radio amateur applicants must carry out two-way contacts with, and shortwave listeners must log reception reports of, radio stations in 100 oblasts (provinces) of the Soviet Union.

There are three categories of R-100-0 awards. The First Class is for two-way contacts on the 3.5-MHz band only, the Second Class is for two-way contacts on the 7-MHz band only, and the Third Class is for two-way contacts on any amateur band. All contacts must be made on phone or CW only. Endorsements will be given for each mode of operation, but cross-mode or mixed-mode contacts are not allowed. All reports exchanged between stations must be RST 337 or RS 33 as a minimum. All contacts or observations must be made on or after January 1, 1957, to be valid.

Applications must include a list of contacts or observations with date, calls, mode, and frequency shown in order of callsign prefix. QSL cards must be submitted along with the award fee of one ruble or 14 IRCs to cover the cost of the award and safe handling of your QSL cards back to you. One should allow three to six months for the processing of any of the awards I am describing. Send all applications and inquiries related to this or any of the following awards to The Central Radio Club USSR, Postbox 88, Moscow, USSR.

W-100-U Award

The W-100-U Award (worked 100 radio stations in the USSR) was established in 1959 on the 100th anniversary of the birth of A.S. Popov, the great Russian scientist claimed to be the inventor of radio. For this award, amateurs must carry out two-way contacts on one or more amateur bands with 100 different amateur stations of the Soviet Union, including 5 radio stations of the 9th region (Minskaya). All contacts must be on either phone or CW, and applications must state which mode is to be credited for the award. Cross-mode or mixed-mode contacts do not count. All contacts must have been made January 1, 1959, or after and all signal reports exchanged must be at least RS 33 or RST 337 to be claimed. As with the R-100-0 award, the applicant must prepare a list of contacts claimed and give the calls, date, frequencies, and type of emissions used to achieve the contacts. The cost of the award is 1 ruble or 14 IRCs, to be sent with your application, and QSL cards are required. The award fee is used to provide for the safe return of your confirmation cards.

R-6-K Award

The worked-all-six-continents award is offered by the Central Radio Club to amateurs and to shortwave listeners who can carry out 12 two-way contacts or observations on SSB, CW, and phone with radio amateurs as follows: one contact each in Europe, South America, Africa, Asia, North America, and Oceania, plus 3 contacts each in the European USSR (UA1, UN1, UW1, UA2, UC2, UP2, UQ2, UR2, UA3, UW3, UV3, UA4, UW4, UB5, UO5, UT5, UY5, UA6, or UW6) and the Asiatic USSR (UD6, UG6, UF, UL7, UI8, UJ8, UH8, UM8, UA9, UW9, UV9, UA0, or UW0). The award has three categories: First Class is for two-way contacts on 3.5 MHz only, Second Class is for two-way contacts on 7 MHz only, and Third Class is for two-way contacts on any amateur band. As with all awards of the Central Radio Club, confirmation cards must be sent with your application. To qualify, all contacts must have been made May 7, 1962, or after. The award fee is 1 ruble or 14 IRCs, the same as it is for each of the awards of the Central Radio Club.

R-10-R Award

The R-10-R Award (worked 10 radio amateur regions in the USSR) is available to those who carry out, on one or more amateur bands, two-way contacts with 10 radio amateur regions in the USSR. These regions may also be termed call districts; in any case, numbers one (1) throughout zero (0) must be worked. All contacts must be made on either phone or CW. Mixed-mode or cross-mode contacts will not count. All contacts must be made after July 1, 1958, and signal reports must be a minimum of RST 337 or RS 33. The submission of applications and the cost of the award is the same as noted with the other awards in the Central Radio Club portfolio.

R-15-R Award

The R-15-R Award (worked radio stations in 15 USSR Republics) is offered to those who work at least 15 of the 18 USSR Republics within a period of 24 hours. They are: European Russian SFSR, Franz Josef Land, Kaliningradsk, Asiatic Russian SFSR, Ukraine, White Russian SFSR, Azerbaijan, Georgia, Armenia, Turkoman, Uzbek, Tadzhik, Kazakh, Kirghiz, Moldavia, Lithuania, Latvia, and Estonia.

All contacts for the R-15-R Award must be made on CW or phone on or after July 1, 1958. Applicant must submit a list of claimed contacts giving date, emission, and frequency for each contact and must provide a QSL card for each contact claimed. Cost and mailing directions are the same as for the other Central Radio Club awards.

R-150-S Award

Probably the most sought-after award in the program offered by the Central Radio Club is the R-150-S Award. Amateurs and shortwave listeners throughout the world are eligible to compete for this award and must complete the following operating requirements to qualify.

The R-150-S Award requires the applicant to work at least 150 countries of the world and 15 Republics of the USSR from a special USSR DX countries listing.

There are no band restrictions, but contacts must be made on either phone or CW. All contacts must be made on or after June 1, 1956. Signal reports exchanged must be a minimum of RST 337 or RS 33.

Submission of applications and cost of the award is the same as noted for the other Central Radio Club awards.

RSES 150

The amateurs of Redford Township, Michigan, invite everyone to help them celebrate their sesquicentennial—150 proud years. This special event station, KG8W, is the culmination of much work by Redford amateurs. The year started with little organization and a station at Thurston High School which had not been on the air in 8 years. For this event, our amateurs have rehabilitated the Thurston station, which consists of a Collins S-Line with 30S1 linear, a Drake TR4C with L4 linear, and a Heath HW16 Novice station. Dave Riley KG8W, who is allowing us to use his call, was one of the last to operate the Thurston station as a student before it was closed down. After this September 24, 0000Z–2400Z event, the station will be operational for use in the Thurston High School electronics program. A specially designed QSL will be returned for your QSL (with contact number) and SASE to: RSES 150, 18800 Beech-Daly, Redford MI 48240. Operating frequencies, dependent on propagation, will be up from 3.6, 3.88, 7.065, 7.215, 14.05, 14.215, 21.09, 21.34, 28.09, 28.6; Novice—bottom 10 kHz of band.

SUNBELT AGRICULTURAL EXPOSITION

The Colquitt County Ham Radio Society will be operating club station WD4KOW from the site of the sixth annual Sunbelt Agricultural Exposition on October 11, 12, and 13, 1983. The hours of operation will be 0900 to 1700 EDST each day.

This annual Sunbelt Expo is held each year at Spence Field Airbase, located near Moultrie, Georgia, and is the largest agricultural show in the south. This event draws over 200,000 visitors from all over the United States and foreign countries.

Operations will be in the General portion of the HF bands. The members will also be listening for visiting hams on the local repeater (146.19/.79). Visiting hams are invited to visit the amateur booth at the Expo and operate the amateur station. A special QSL card is available for those making contact during this event who submit an SASE.

SUFFOLK COUNTY NY

Suffolk County Radio Club will operate W2DQ from 0000Z October 28 until 2400Z October 30 in celebration of Suffolk County's 300th birthday.

Frequencies: phone–15 kHz up from lower 40-15-meter General-class band edges; Novice—21.135.

For a special certificate, send a large SASE to Richard Tygar AC2P, 5 Chelmsford Drive, Wheatley Heights NY 11798.

NAVY WEEK SPECIAL EVENT STATION

On October 30, 1983, the Laurel, Maryland, Amateur Radio Club will operate K3LDE on board the *USS Constellation* from 1200 to 2200 GMT. Operating frequency will be 7225 with QSY to 14225 and 21400 per band conditions. They request 3 first-class stamps to cover mailing tube and specially-designed certificate. Send requests to: Laurel MD ARC, Box 259, Annapolis Junction MD 20701.

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½"×11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye." and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

Vertical Vibroplex and other old keys wanted for a private collection.

Dick Randall K6ARE
1263 Lakehurst Rd.
Livermore CA 94550

Wanted: a 21-MHz radiator trap or a set of traps for the Telrex TC99C antenna.

Dan A. Summers W4JB
1712 SE 14th St.
Ft. Lauderdale FL 33316

I have photocopies of manuals for the following gear: Drake 2NT, 2B, 2LF, 2AQ, and 2AC; Hammarlund HQ-100A; and Hallicrafters HT-144 and SX-117. If you need a copy of any of these, I will send it to you in return for shipping and copying costs.

C. R. Weinstein N9EHD
Box 52
Golden City MO 64748

I want to replace the tubes in my Collins R-392 receiver with solid-state devices. Any information on replacement parts would be greatly appreciated. I also need information on the R-392 Club and sources for 2-kHz filters for the Collins R-390A.

J. P. Barnes G8AHN
2 Mappins Rd.
Catcliffe, Rotherham
South Yorkshire S60 5TH
England

I need schematic diagrams and service manuals for a Hewlett-Packard model 130A oscilloscope. Please write to me before sending the material; I will pay copying and postage costs or will copy and return original.

Andrew Zenisek
941 Maryville Dr.
Lockport IL 60441

I want to use an American Microsystems S2559 touchtone pad in a standard rotary-dial telephone and in an amplified version. Can anyone help me?

John Hendry
KKYN
Box 147
Plainview TX 79072

I need manuals and schematics for Terminal Communications models TC 235 and TC 62. I will pay for copying and postage.

Jerry Dotson
27 Center Street
Worthington IN 47471

NEW PRODUCTS

BYTESIZE OFFERS A CASSETTE INTERFACE

The VIK-Dubber cassette interface allows VIC-20 and C64 users to save and load data using any standard cassette recorder. The VIK-Dubber circuitry filters and enhances the cassette data, virtually eliminating bad loads. It also includes several features to allow easier cassette use; it allows you to connect two cassette recorders together to make high-quality backup copies of cassette programs, even machine language. An indicator light and quiet audible tone help you to adjust cassette volume for proper use and allow you to monitor the cassette data. The VIK-Dubber gets its power from the computer, so no batteries are needed. It comes in an attractive case, tested and ready for immediate use.

For more information, contact *Bytesize Micro Technology, PO Box 21123, Seattle WA 98111; (206)-236-BYTE.* Reader Service number 481.

The VIK-Dubber cassette interface from Bytesize Micro Technology.

TURNING THE TRS-80 COLOR COMPUTER INTO A CW MORSE-CODE TERMINAL

A recently introduced modem called the KA9FSQ CW modem interface changes the RX tone into a signal pulse. This makes it possible for ham-radio operators to transmit or receive Morse code on their TRS-80 Color Computers.

A visual indicator (signal LED) is mounted on the unit for the indication that you're locked in on the signal and it is being received. While other units use a mechanical relay for TX, the KA9FSQ CW modem uses an optoisolator to keep keying voltages away from your computer and give a clean digital pulse to your transmitter. This unit can also be used with other CW programs with proper software modifications.

The modem is easy to use. Just plug the cartridge into the ROM-PAC slot on the side of your Color Computer and connect two cables, one from your transmitter and one from your receiver. Turn your computer on and CLOAD the program from tape. RUN the program and sit back for Color-Computer Morse.

For more information, contact *Mitronix, 5953 N. Teutonia Avenue, Milwaukee WI 53209.* Reader Service number 478.

NEW CATALOG FROM UNIQUE COMMUNICATIONS

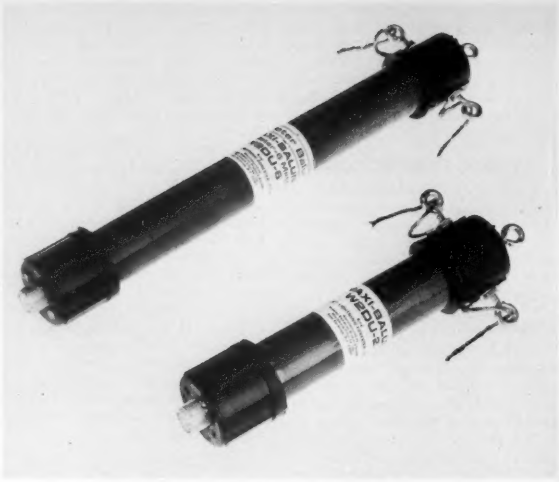
Unique Communications has released its new 72-page catalog of telephones and accessories. This catalog lists a variety of products ranging from desk-type rotary telephones complete with memory dialing, mute switch, and automatic redial. Reconditioned and new telephones are available in many price ranges.

Other telephones available from Unique Communications include one-piece rotary and touchtone phones, Slimline-style phones, and cordless extension phones.

For more information, contact *Unique Communications, 6335 S. R. 97, Gallion OH 44833; (419)-468-6972.* Reader Service number 483.

MICROWAVE FILTER CO. "MAXI" BALUNS

The Unadilla/Reyco/Inline W2DU-(6) and W2DU-(2) "Maxi" baluns handle 3.5 kW of power. Model W2DU-(6) is used for 160–6-meter applications, while the W2DU-(2) handles those in the 6–1-1/4-meter range. Pull-apart tensile strength is rated at more than 600 pounds. The baluns are adaptable to dipoles, inverted vees, quads, and yagi antennas. Both are contained in weatherproof housing and have built-in lightning arrestors.



"Maxi" baluns from Microwave Filter Co.

For more information, contact Sandy Weegar at *Microwave Filter Co., Inc., 6743 Kinne Street, East Syracuse NY 13057; (800)-448-1666.* From New York, Canada, Hawaii, and Alaska, call collect at (315)-437-3953. Reader Service number 479.

A VARIABLE-TEMPERATURE SOLDER SYSTEM BY UNGAR

A low-priced variable-temperature-controlled soldering system has been introduced by the Ungar Division of Eldon Industries, Inc. A rotary control on the base enables the user to vary the temperature in 50-degree increments from 400 to 800 degrees F. While the unit makes temperature-controlled soldering feasible for hobbyists and do-it-yourselfers, the Electronic Soldering System 9100 has features previously developed for the Electronic System 9000 for high-technology induction use.

Ungar's recently introduced Thermo-Duric™ heating element, which combines an efficient heater and sensitive tip-temperature sensor, quickly recovers tip temperature after each solder joint. The smaller heating element also makes possible a thinner, cooler handle.

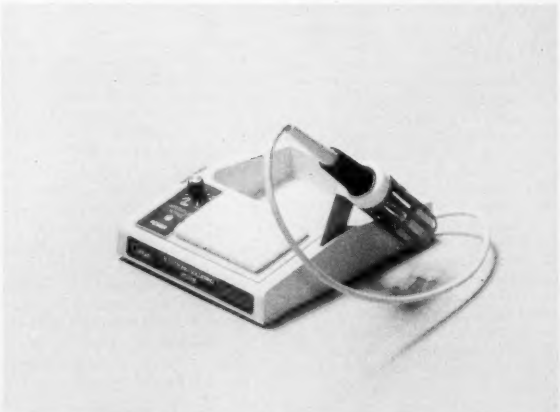
The iron holder can quickly be changed to the left or right side of the stand. Any of five Ungar soldering iron tips can be used. The system is electrically conductive from the tip to a grounded wall plug to prevent static electricity damage to microcircuits.

Further information is available from *Ungar, 100 W. Manville St., Compton CA 90220; (213)-774-5950.* In Canada: *Eldon Industries of Canada, Markham, Ontario L3R 1H5; (416)-495-9407.* Reader Service number 477.

THE FLESHER CORPORATION ROM-116 INTERFACE

Flesher Corporation has announced that it now exclusively distributes and sells the ROM-116. The ROM-116 interfaces to the Radio Shack TRS-80 models I, III, and IV with 16K minimum memory. Some of the features included are two serial ports, fourteen buffers, formatted or unformatted split-screen display, vertical status display, automatic CW ID, PTT control, selcal, error correction, and a text

The KA9FSQ CW modem from Mitronix.



The variable-temperature-control "Soldering System 9100" from Ungar.

editor. The interface also offers two independent callsign buffers, adjustable line length, all standard Baudot and ASCII baud rates (up to 1200 baud), and CW receiving and transmitting with full break-in.

Several software packages, including a mailbox program, are available.

For more information, contact *Flesher Corporation, PO Box 976, Topeka KS 66601; (800)-HAM-RTTY.* Reader Service number 476.

NEW HUSTLER ANTENNAS

With the renewed interest in 6-meter amateur operation, Hustler has added three new models to fulfill most antenna requirements.

The 6-MB3 3-element yagi features a 6-dB forward gain while maintaining a front-to-back ratio of 28 dB. Bandwidth is 2 MHz with an swr under 2:1. Resonance is centered at 50.1 MHz with an swr under 1.2:1.

Model G-3754 is an omnidirectional vertical endfed collinear antenna for fixed-station use, appropriate for repeater applications. Bandwidth is 1 MHz with an swr under 2:1. The antenna's gain is 3.4 dB developed from a .64-wavelength radiator. Vswr is 1.2:1 at resonance. The G-3754 and 6-MB3 are constructed of high-grade seamless aluminum tubing and stainless-steel hardware for durability and long life.

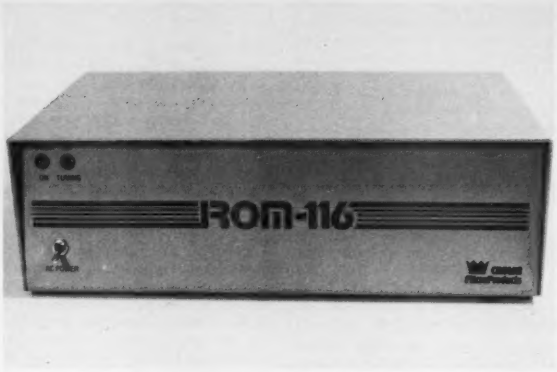
For mobile use, the new BBL-4554 base-loaded antenna features a 48-inch overall height and shunt-fed design for performance on any mode—FM, AM, or SSB. The antenna is supplied complete with stainless-steel impact spring, 3/4-inch hole mount, and 17 feet of RG-58/U coaxial cable with a PL-259 connector installed.

For further information, contact *Hustler, Inc., 3275 North B Avenue, Kissimmee FL 32741.*

NEW 10M TRANSCEIVER FROM HEIL SOUND, LTD.

A very economical amateur-radio transceiver is now in production at Heil Sound, Ltd., in Marissa, Illinois. The 10-meter FM-10T is a completely wired and tested version of the kit that Heil introduced in 1979. The FM-10T is a complete transceiver capable of operating 29.60 to 29.70 MHz. Several added options are included in the FM-10T, such as the 6-kHz wideband FM filter, repeater offset, microphone, transmit-receive LED, and the 40-channel program switch and knob. The FM-10T is in a black and white aluminum housing.

For more information, contact *Heil Sound, Ltd, Heil Industrial Blvd., Marissa IL 62257.* Reader Service number 484.



The Flesher Corporation ROM-116.

Icom's IC-120 1.2-GHz transceiver.

The Hal Communications Corporation CT2200 communications terminal.

HT POWER AMPLIFIERS FROM MFJ

MFJ Enterprises now offers 430-MHz and 2-meter power amplifiers which are small enough to mount on your HT. The MFJ-2040 (for 144–148 MHz) will deliver from 7 to 20 Watts output with an input from 0.1 to 3 Watts. The MFJ-2045 (for 430–440 MHz) will produce 4 to 15 Watts for the same input. Transmit/receive switching is carrier operated. The die-cast aluminum body is 1-1/2 inches in diameter and 3-3/4 inches long, which makes these amplifiers small enough to fit between your antenna and HT. The amplifiers require 12 to 13.8 V dc at 50 mA for receive and 1 to 2 Amps for transmit.

For more information, contact *MFJ Enterprises, Box 494, Mississippi State MS 39762; (800)-647-1800.* Reader Service number 482.

ICOM'S NEW 1.2-GHZ FM MOBILE TRANSCEIVER

The IC-120 is a 1.2-gigahertz FM mobile transceiver covering 1260 to 1300 MHz. This unit is styled similarly and has features similar to the IC-25A/H series of 2-meter transceivers and has many common features. Duplex split is variable, but is initiated at 20 MHz when the unit is first turned on. Duplex up and down as well as scanning features are offered. Power output is 1 Watt. Icom is the first to offer hams a full-featured mobile transceiver for this mostly unused band.

For more information, contact *Icom America, 2112-116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*

HAL OFFERS NEW CT2200 COMMUNICATIONS TERMINAL

The CT2200 is the successor to the CT2100 communications terminal. It offers all of the features of the CT2100 plus keyboard programming of all eight "brag-tape" messages and programmable selective call control of the printer output. The terminal also has a manual printer on/off control, non-volatile storage of HERE IS, "brag tape," and selective-call codes, and new rear-panel connections for use with the ARQ1000. The CT2200 is a new product that replaces the previous CT2100, but an update kit (including a new front panel) is offered to upgrade the CT2100.

For more information, contact *Hal Communications Corp., PO Box 35, Urbana IL 61801; (217)-367-7373.* Reader Service number 480.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Let me take a wild guess. I will bet that many of you active on RTTY are still using some form of old, boat-anchor type of equipment. Right? I thought so. For just because this equipment is old does not mean it cannot still put out a fine signal on RTTY. With proper interfacing—such as we have covered here in months gone by—even a thirty-year-old transmitter can be connected to a modern RTTY terminal.

But just as there are changes which bring a new season, so have hams changed from power- and space-hungry tube equipment to the new state-of-the-art, solid-state, compact transceivers. Many of them feature a RTTY or FSK detent on their mode switch, but are they really usable? Promotional literature does little to point out those minute features which make operation on FSK a pleasure or a pain, but the average ham will turn them up in a few hours of on-the-air time.

I recall the flap which arose a number of years ago when a well-known company offered a transmitter which featured an FSK mode, ostensibly designed for radioteletype. However, entering that mode shifted the transmit frequency almost three kilohertz from the receive frequency, making it impossible to use the transmitter with its companion receiver in transceive mode on RTTY. It is because of such problems that modifications are made, and I solved that one and published the solution some years back.

Let me know what your experiences are with some of the newer HF equipment being sold which features a RTTY mode. I will try to pass along whatever information I get that I can verify on what's good, bad, or super in the way of equipment to put RTTY on the air. And if you are considering buying a new transceiver, watch here for whatever information we turn up which may influence your choice.

Speaking of your choices, the mail has been running heavy lately. Let's see what some of you have to say.

From St. Leonard, Maryland (quite a distance from me here in the Baltimore area), comes a letter from V. L. Thrasher KB3FS. V. L. writes that he has looked through all the catalogs he has in search of some 88-mH toroids mentioned here some months back, with no luck. He is using a Model 15 Teletype® with an ST-5 type demodulator and wants to build an oscilloscope display which will require the toroids.

Well, V. L., several years ago it was relatively easy to find a parts house that advertised the toroids in question. Usually surplus or removed from service in bundles of five, they most often originated with telephone company equipment. But as that source has modernized and thus obviated the need for toroids in tuned circuits, the supply of toroids has also dried up. I would first suggest searching

through catalogs of surplus jobbers, as I assume you have done. Coming up blank there, ask around at the local ham club or the like; often a pack-rat ham, such as I was in my younger days, will have two or three bunches of toroids stashed for a rainy day.

If all this fails to find any, I have found that the best place to find odd parts at the right price remains a hamfest, and this column should be published right around the time of the big Foundation for Amateur Radio hamfest which takes place in Gaithersburg, Maryland (a suburb of Washington DC), every fall. Check the tables there, and good luck.

As an aside to those of you in the sales end of this parts problem, don't forget the home-brewer. Even though a great bulk of hams purchase high-tech gear, a trend which this magazine has shown, building it yourself is far from dead! We need parts—resistors, capacitors, coils, and the like—besides the semiconductors that are available everywhere. Address that market and you may find that you are alone in the field, with plenty of takers.

Regards to Ron Hatton WA4BDY/DA2SR, who currently uses an APO box in New York for his mail. Ron is a computer buff who numbers himself among those waiting for a RTTY program. Also in that crowd is Ray Baumiller WB3HDZ, from Montgomery, Pennsylvania. What these fellows and many others are interested in is a program to place one of the easiest microprocessors ever devised, the Motorola 6800, on RTTY as a full-featured RTTY terminal. Such schemes are being used commercially, as with the excellent series of products being produced in Gaithersburg, home of the hamfest, by Microlog. By choosing the 6800 as their CPU, this fine company is able to produce a versatile RTTY terminal with all of those features the active ham requires.

Of course, as has been stated here before, many consider the 6800 and its family of related chips a dead series. But as Larry Antonuk WB9RRT/1, in Keene, New Hampshire, puts it, "Is the Model 28 dead? Of course not." He is another in the group that would like to see a program devised to transmit and receive RTTY which would not require buying the latest high-tech box.

Unfortunately, it would appear that such a program may well be too limited in appeal to publish here, no matter how vocal are those who desire it. Therefore, I shall be investigating other ways of disseminating the kernels of this program so that it can be used by those interested. At the same time, I will not bore those who are tired of reading about CPUs, RAM, ROM, etc., by continuing to discuss those topics in "RTTY Loop."

That said, I would like to add one thing. Nothing is cast in concrete. If there is a topic you would like to see covered in this column, and I have not covered it to your liking, write me and write the editors of *73*. Let your voice be heard! If enough of you want to read about this or that, I am sure the editors will give it the nod.

On a sadder note, I have received word that the Stark RTTY group in Massillon, Ohio, is dwindling. I am not sure of the origin of the dwindle but hope that the situation is only temporary. Through the years I have been involved with many clubs and organizations (not all of them amateur radio in nature) which go through such a period of ebb tide. Often they just fade away, and all the work and love put into them by the founding members is discarded as so much old rubbish. But sometimes, not often, but sometimes, a new spark is felt which rekindles the interest. Let's hope such a spark strikes in Ohio real soon. Keep me posted, folks.

Observant readers will note that the address at the top of the column has changed once again. I am now at the new QTH and shall do what I can to get on the air as quickly as time, finances, and the XYL allow. In the meantime, I plan some rather exciting editions of "RTTY Loop" in the months to come: a look at AMTOR for example—the new, but really not so new, technique of sending RTTY that is essentially error-free. And we'll also have feedback from my questions to you about on-the-air mailboxes, commercial equipment, and the other things that bug and cheer the amateur on RTTY. Stay with me, and let me know what you are doing!

DR. DIGITAL

Robert Swirsky AF2M
412 Arbuckle Avenue
Cedarhurst NY 11516

Good news! The FCC has lifted that silly identification restriction for RTTY. Since June 15, 1983, there is no longer any need to ID in CW or voice while running Baudot, ASCII, or AMTOR. If you are running some other digital code, you must ID in any one of the three "accepted" digital codes. Of course, you can still ID in voice or CW if you like that sort of thing.

A while back, John Edwards KI2U (you know him as Mr. Fun!) petitioned the FCC concerning this very issue. John correctly pointed out that the CW ID requirements were a major annoyance to RTTY operators; the CW often messed up the printout. Just as a courtesy, John sent a copy of the petition to the ARRL. He received a nasty reply saying his request was a foolish one and the FCC would "never in a million years" go for such a silly proposal. Well, ARRL? Don't tell me a million years have already elapsed.

I found it interesting that many amateurs are upset about the new identification rule. It seems that some feel the RTTY people will now take over amateur radio, transmitting in their "secret code" that only other RTTY operators can copy. I wonder if the AMers wanted the SSB people to identify in AM, or if the spark-gap people wanted the CW people to identify with a modulated spark-gap rig? Why is it that even the most minor rule changes must overcome considerable inertia before being accepted by the amateur community?

Cyclic Redundancy Checks

Last month, we discussed the Longitudinal Redundancy Check. While the LRC is certainly easy to implement, it isn't that efficient. There are many errors that it can't detect or correct. A better error-correcting scheme is called Cyclic Redundancy Check (CRC). It is more efficient that the LRC and can detect and correct a wider variety of errors. But there is a catch...

"There is no such thing as a free lunch," the adage goes. The CRC is a little bit more difficult to understand than the LRC and is harder to implement. Bear with the explanation. It might seem difficult at first.

The CRC involves representing a series of bits as the coefficients of a polynomial expression; let's call this expression the message function M(x). This message function is operated on by a generator function of a lower degree than M(x). Before the transmission of data, the message polynomial is operated on as shown in Fig. 1.

The generator polynomial is chosen according to certain criteria depending on amount of redundancy desired and the number of bits transmitted in each block. Also, multiplying the message polynomial M(x) by X^P will result in adding P zeroes in the least significant positions of M(x) without disturbing the higher-order bit positions. Division by the generator polynomial P(x) is done using modulo-2 arithmetic (no carries). Q(x) is the quotient, and the ratio R(x) over P(x) is, of course, the remainder. The result of this process yields a string of x bits which is appended to the data block and transmitted along with the message data. The transmitted message is the polynomial T(x).

On the receiving end, the message is operated on using the same generator polynomial as the transmitter. Fig. 2 shows the equation for this operation. If the remainder is anything other than zero, an error has occurred. The position of the errors can be represented by another polynomial, E(x), which would be of the same form as T(x) (the transmitted message). The relationships among all these polynomials can be seen in Fig. 3.

To recapitulate in simpler terms, the CRC involves subjecting your data to a specific formula. The person receiving the data applies the same formula; if the remainder is non-zero, there was an error. By examining the value of the remainder, it is possible to detect a large number of errors. Cyclic codes are more efficient in detecting errors than any other method; less redundancy can find more errors.

$$M(x) = Cx^n + Cx^{n-1} + Cx^{n-2} + \ldots + Cx^0$$

$$M(x)x^P / P(x) = Q(x) + R(x)/P(x)$$

$$T(x) = M(x)x^P + R(x)$$

Fig. 1. Equations for the message polynomial, the generator operation, and the transmitted message.

$$T(x)/P(x) = M(x)x^P + R(x)/P(x) = Q(x) + \text{Remainder}$$

Fig. 2. If remainder is not zero, an error has occurred.

$$T(x) + E(x)/P(x) = T(x)/P(x) + E(x)/P(x)$$

Fig. 3.

Need Help With Math?

If it has been a while since high school and you are out of practice with mathematics, there are two books I strongly recommend. The first is *Realm of Algebra*, by Isaac Asimov, Fawcett Crest, New York, 1967. This concise 143-page book clearly describes arithmetic and algebra and demonstrates practical applications. If you just want to brush up on your algebra, this book is ideal.

Less succinct, but covering more topics, is the classic *Mathematics for the Millions*, W. W. Norton & Company, New York, 1983. First published in 1937 by Lancelot Hogban, this 648-page book is regarded as one of the best guides to mathematics for the layman. Despite its length, it is not prolix; this book is a complete course in mathematics starting at the very beginning and leading into advanced topics. In fact, given the comprehensiveness of this volume, it is remarkable that it is under 1000 pages. Both of these books are in paperback. If you feel limited because of an inadequate mastery of math, these books will prove most helpful.

Computer Slow Scan

Using the graphics capabilities that many microcomputers have combined with a reasonable amount of memory, microcomputer slow scan is feasible. Although few of the home computers have the proper graphics features for a full-resolution SSTV picture, reasonable results can be obtained by sacrificing grey levels. A commercial scan converter (e.g., Robot) usually produces a picture that has 128 by 128 pixel resolution with 16 shades of grey. Many microcomputers can easily handle the 128 by 128 pixels but lack the grey-scale capabilities.

One of the earliest efforts with computer SSTV was by Dr. C. H. Galfo WB4JMD. The Galfo SSTV program, without *any* additional hardware, enables an Apple II owner to receive SSTV. Using a resolution of 128 by 128 with three grey levels, the program adds some random noise to the picture to give the illusion of an increased grey scale. While the pictures are very high contrast, they are quite acceptable. I have found that the smaller the monitor, the better the results; on a 5-inch TV, the pictures are very clear.

SSTV uses the following tones: 1200 Hz (sync), 1500 Hz (black), 1900 Hz (grey), and 2300 Hz (white). Of course, if the hardware is capable of handling more grey levels, additional tones between black and white will be decoded.

Dr. Galfo's program is able to decode SSTV with no additional hardware due to the characteristics of Apple's cassette interface. The program is an excellent example of software replacing hardware. Also integrated with the Galfo SSTV program is a routine to transmit SSTV. Characters and block graphics are entered using the keyboard, and the computer translates them into the appropriate SSTV tones which come out the cassette port.

Apple uses a zero-crossing detector in the circuit of the cassette port. Every time the audio waveform into the detector crosses the zero line, the detector changes its state; if it was a 1, it is now 0 (and vice versa). Since the Apple II uses memory-mapped I/O, the state of the cassette port can be determined by doing a read to the proper location. If the computer is programmed to count from one 0 to 1 transition of the cassette port to another, and if the amount of time it takes for the counting routine to increment is known, the frequency can be determined. This is the method that Dr. Galfo uses in his SSTV program; the same method has also been used in a number of programs that demodulate RTTY with an Apple and no additional hardware.

It should not be all that difficult to use other computers for SSTV. One micro that might be suitable is the Atari. Atari uses a custom microprocessor to control the graphics; this is separate from the main 6502 microprocessor. The graphics pro-

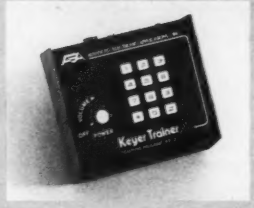
Morse Keyers & Trainers by AEA

AEA produces the finest Morse keyers and trainers in the world. All AEA keyers operate with any standard keyer paddle and offer selectable monitor tone, selectable dot and dash ratios, full weighting and selectable dot and/or dash memory. In addition, all our keyers offer full, semi-automatic or straight key modes. The keyers and trainers are keypad controlled which significantly reduces the complexity of operation for all the features offered. Each keyer has separate + and - keyed outputs for keying any modern transmitter. All keyers and trainers operate from 12 VDC (or 117 VAC with optional model AC-1 wall adaptor) which makes them ideal for portable operation. AEA microcomputer-based products are all subjected to a full burn-in and test prior to shipment, as well as being designed for maximum R.F. immunity.

NEW BT-1

The **BT-1 Basic Trainer** is a hand-held computerized unit which teaches the code one character at a time at 18 or 20 words per minute. The BT-1 contains a self-paced training program that allows serious students the possibility of learning Morse to 20 wpm in as little as one month! Each character represents a separate practice session in which the character is first introduced by itself, and then presented 50% of the time along with all previously learned characters. There are no tapes to memorize, wear out, or break. No programming skills are necessary; the BT-1 is very easy to use. The tone oscillator can also be keyed for sending practice. An earphone jack is provided for private listening. The BT-1 will go as high as 99 WPM in 1 WPM increments. A battery operated version, the BT-1P, is available with wall charger and internal NICAD batteries.

NEW KT-3



The **KT-3 Keyer-Trainer** unit uses the teaching program used in the BT-1 trainer. In addition, the KT-3 features a full function Morse automatic keyer for keying any modern transceiver, or for sending practice. Speed range is 18-99 wpm for transmitting and 1-99 wpm for training.

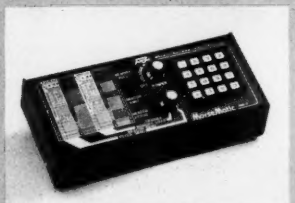
KT-2 Keyer Trainer

The **KT-2 Keyer-Trainer** is a computerized keyer with all the features shown above, plus a Morse proficiency trainer. It is designed to increase your existing code as quickly as possible. The unit can be set for beginning practice speed, ending practice speed, and duration of practice. The microcomputer does all the rest by gradually increasing the speed during the practice time selected. You can even select between fast code (Farnsworth) or slow code methods. The characters are sent in 5 letter groups, or random word lengths. Two levels of difficulty can be selected; common Morse characters or all English Morse characters. A 24,000 character answer book is provided for the 10 separate starting positions. There is also random practice mode for which no answers are available.

CK-2 Contester™

The **CK-2 Contester™ Keyer** is the lowest cost automatic keyer available featuring an automatic serial number generator for contesting. The CK-2 keyer features a large 500 character message memory that can be soft-partitioned into as many as 10 sections. An exclusive AEA edit mode makes it possible to correct mistakes made while entering messages or to insert words into previously established messages. Two different speeds can be set for fast recall in addition to a stepped variable speed control. The CK-2 features an automatic message repeat mode with variable delay-before-repeat for automatic CQ transmissions or TVI testing.

MM-2 MorseMatic™



The **MM-2 Morsematic Keyer** represents the most sophisticated paddle keyer ever designed and features two powerful microcomputers. The Morsematic incorporates virtually all the features (except the preset and stepped variable speeds) of both the CK-2 and KT-2 shown above. In addition, the MM-2 offers an exclusive automatic beacon mode which is invaluable for meteor scatter, moonbounce scheduling, or beacon operation.

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cessor is controlled by a special program called a display list. Further control over the graphics can be obtained by controlling the amount of Direct Memory Access (DMA) the chip gets during the horizontal-scanning interval. In the highest resolution graphics mode, with the DMA register set for 128 pixels across and the display list constructed for 128 lines vertically, the 128-by-128 resolution can be achieved without wasting any memory.

Because the graphics memory can be located anywhere in main memory and an interrupt can be generated during the vertical blanking interval, it is a simple matter to swap among a number of graphics memory pages every 60th of a second. Since the swap occurs during the vertical blanking interval, no flickering will occur. If four 128-by-128-bit pages are cycled on the screen, it can give the appearance of 6 grey levels.

The Atari's DMA requests from the graphics microprocessor leads to a problem: The computer can't time an event by counting clock cycles. Whenever a DMA request occurs, the microprocessor will halt briefly, causing timing disturbances. This would make it difficult to decode SSTV in software. One possible solution is to have a one-line tuning indicator on the screen while the computer is decoding. The DMA calls needed to display 1 line of character graphics would not interfere with the 6502 microprocessor as severely as a full-screen graphics display. The disturbances in timing that the DMA requests do incur can be accounted for.

The Atari cassette port, unlike Apple's, does not have a zero-crossing detector (it is incorporated within the 410 or 1010 recorder). A suitable circuit for a zero-crossing detector is in Fig. 4. This circuit will provide a TTL-level signal. Every time the audio signal crosses the base line (Fig. 5), the state, 0 or 1, will change.

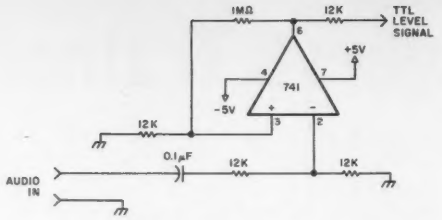

Fig.4. Zero-crossing detector.

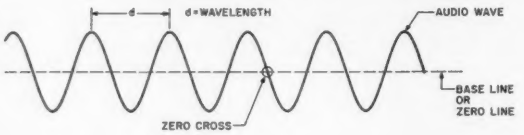

Fig.5.

Graphics Standards

It would be nice if one could exchange graphics over the air between computers. Since many computers have graphics, all that is needed is a standard. While protocols exist—such as NAPLPS (North American Presentation Level Protocol Syntax)—they are probably overkill for a radio amateur's needs. A simpler way, which can be made compatible with NAPLPS, would be to devise a special graphics character set that would contain symbols needed for amateur radio. The advantages of character-set graphics are numerous: Many computers can accommodate alternate character sets, standard ASCII can be used to transmit the data, any printer with programmable character sets can be used for hard copy, and it will keep graphics information compact.

I would appreciate any suggestions regarding a ham-radio graphics character set. My final decision as to what the character set contains will be in an upcoming column. It would be nice if such a character set became commonly used on amateur radio; just think, using the character-set symbols over RTTY, you'll be able to exchange schematic diagrams and flowcharts!

Keep those letters coming in! Remember: If you want a reply, please enclose an SASE.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

HAM SLANG

What do you think Mr. FUN! does when he goes looking for excitement? Well, one of the things he's likely to do is grab his brother, catch the Eastern air shuttle, and spend a day museum hopping in our nation's capital.

While my favorite spot is the National Air and Space Museum (with its OSCAR 1 exhibit), a close second is the recreation of the 1876 Centennial Exposition at the Science and Technology Museum. Last Saturday, as my brother and I were browsing through the impressive display of ladies' bustles, steam engines, and patent medicines, we stumbled upon a section of the museum we had never noticed before—an exhibit devoted to Samuel Morse (of Morse code fame). Among the objects on display were Morse's notebooks, his medals, and a very wide selection of telegraph keys, relays, and related equipment.

"Hey!" shouted my brother (WB2LWJ). "You know something?"

"What?" I replied.

"Everything else in this museum is straight out of a history book. But this exhibit looks like it came out of a modern ham shack."

"Jim, you're very astute," I noted. "You see, many hams regard 'state-of-the-art' technology as equipment that existed at the year of their birth. Most think that change is something to be feared. 'If it worked in the past it's good enough for today,' is the conventional wisdom."

"Is that why the ARRL intends to use CW nets in the event of nuclear disaster?" asked Jim.

"Yes," I answered, admiring my reflection on the surface of one particularly nifty bug.

"Isn't that sort of like the Polish government relying on its cavalry to defeat the invading German Panzer Corps?" he questioned.

"Museums can teach their visitors all sorts of things," was my response as we moved over to the display of hand-cranked printing presses.

Our topic this month is ham slang—you know—the buzzwords and jargon we use to scare newcomers away from our hobby. Next to CW, it's our best line of defense.

ELEMENT 1
MULTIPLE CHOICE

1) While there are many explanations for the origin of the term "ham," which of the following is the most commonly accepted?
 1) A telegrapher's term for a show-off
 2) A telegrapher's term for a poor operator
 3) A telegrapher's term for a good operator
 4) We were named after the "ham switches" found in most turn-of-the-century shacks

2) In the early days of our hobby, what was another common nickname for a radio amateur?
 1) Spark Jockey
 2) Plug
 3) Beefer
 4) Wirelessist

3) One hundred and sixty meters is often called:
 1) The top band
 2) The bottom band
 3) The DX band
 4) The quiet zone

4) You'll find the "graveyard":
 1) On 27 MHz
 2) On 2 meters
 3) In the AM broadcast band
 4) After standing near a microwave dish

5) Prior to 1976, what was meant by the term "Novice Gallon"?
 1) The supposed amount of perspiration generated by a prospective ham during the Novice theory test
 2) 100 Watts of input power
 3) 250 Watts of input power
 4) 75 Watts of input power

ELEMENT 2
MATCHING

Q signals were originally developed to help speed CW communication. Today, ham radio just wouldn't be ham radio without these confusing little buggers popping up during our daily "QSOs." Try and match the Q signal in Column A with its correct meaning in Column B.

A	B
1) QRG	A) I have nothing for you
2) QRH	B) Repeat your last message
3) QRI	C) It is my turn
4) QRK	D) I am busy
5) QRL	E) Increase your power
6) QRM	F) Your antenna is faulty
7) QRN	G) Send faster
8) QRO	H) I am calling you on
9) QRP	I) Your signal is fading
10) QRQ	J) I am ready
11) QRS	K) Stop sending
12) QRT	L) Your frequency varies
13) QRU	M) You are being called
14) QRV	N) I am acknowledging receipt
15) QRW	O) Decrease your power
16) QRX	P) Call me again
17) QRY	Q) Send messages
18) QRZ	R) Your signal is distorted
19) QSA	S) Send slowly
20) QSB	T) I am troubled by static
21) QSD	U) Your transmission is being interfered with
22) QSG	V) Your exact frequency is
23) QSK	W) The tone of your transmission is
24) QSL	X) Your intelligibility is
25) QSM	Y) Your strength is
	Z) Break your transmission

ELEMENT 3
SCRAMBLED WORDS

Unscramble these examples of ham slang:

NIEACMH	MINTERDO
QCHLESU	CAIND
YREKE	MCTAMSNART
PUPIEL	TEN
AXF	GIR
TFIHS	UADQ

THE ANSWERS

Element 1:
1—2 Then what's a "lid"? A bad, bad operator?
2—2 A plug, like a ham, was a poor operator.
3—1 Tops in wavelength; also known as the "gentleman's band."
4—3 That portion of the band (roughly between 1200 and 1400 kHz) where the FCC assigns low-powered broadcasters.
5—4 Using crystal control, of course.

Element 2:
1—V, 2—L, 3—W, 4—X, 5—D, 6—U, 7—T, 8—E, 9—O, 10—G, 11—S, 12—K, 13—A, 14—J, 15—H, 16—P, 17—C, 18—M, 19—Y, 20—I, 21—R, 22—Q, 23—Z, 24—N, 25—B.

Element 3:
(reading from left to right) MACHINE, INTERMOD, SQUELCH, NICAD, KEYER, TRANSMATCH, PILEUP, NET, FAX, RIG, SHIFT, QUAD.

SCORING

Element 1: Seven points for each correct answer.

Element 2: One point per match.

Element 3: Three points for each word unscrambled.

Where do you stand in the jargon jungle?

- 1-20 points—Think a Wouff Hong is a new Japanese HT.
- 21-40 points—Call CQ on repeaters.
- 41-60 points—Reside in a QTH, but think 10-codes are silly.
- 61-80 points—Five by nine.
- 81+ points—FB, OM!

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.33 µf;-1.90 ea .68 µf;-3.90 ea

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D-20	20	33	27.95	23.95
D-15	15	22	26.95	22.95
D-10	10	16	25.95	21.95
Shortened dipoles				
SD-80	80,75	90	35.95	31.95
SD-40	40	45	32.95	28.95
Parallel dipoles				
PD-8010	80,40,20,10,15	130	43.95	39.95
PD-4010	40,20,10,15	66	37.95	33.95
PD-8040	80,40,15	130	39.95	35.95
PD-4020	40,20,15	66	33.95	29.95
Dipole shorteners - only, same as included in SD models				
S-80	80,75		$11.95 pr	
S-40	40		$10.95 pr	

All antennas are complete with a HI-Q Balun or HI-Q Antenna Center insulator, No. 14 antenna wire, ceramic insulators, 100 nylon antenna support rope (SD models only 50) rated for full legal power. Antennas may be used as an inverted V and may also be used by MARS or SWLs.

Antenna accessories—available with antenna orders

Nylon guy rope 450# test 100 feet	$4.49
Ceramic (Dogbone Type) antenna insulators	$1.50 pr
SO-239 coax connectors	.55

All prices are postpaid USA 48
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↙See List of Advertisers on page 114

REVIEW

READER COMMENTS: GORDON WEST TAPES

I read with pleasure the comments of Avery L. Jenkins WB8JLG, *73* Staff (page 120, *73*, July, 1983), regarding the code cassettes of Gordon (Gordo) West WB6NOA.

Gordon West's cassettes are truly a great advance. In addition to being in stereo compatible with mono, the cassettes are professionally recorded on C-90 high-quality cassettes. West's cassettes—unlike the ARRL code-practice cassettes—are generated by computer and sound *exactly* as the FCC exams sound. For some reason, the ARRL generates code at 16 wpm with spacing to slow it down, and at 13 wpm the sound does not sound similar to the FCC tests. I used the ARRL cassettes to get my speed up (I thought) to 13 wpm and promptly flunked the FCC 13-wpm code exam twice. Then I discovered the West cassettes, and in March, 1983, I passed the FCC 20-wpm code and written exams on the first attempt (I now have an Extra-class license).

Also, there are excellent West cassettes available for the theory part of the Novice, Technician, Advanced, and Extra written FCC exams. These are not designed to stand alone but, in my opinion, are excellent training aids. The West cassettes certainly worked for me and I am extremely grateful to Gordon West.

It should be pointed out that my only contact with Gordon West is as a customer (a very well-satisfied customer).

These cassettes are very useful to listen to in an automobile using the cassette stereo system. While learning the code, the trainee can merely listen—without writing the copy—to recognize the letters instantly. Of course, one must also learn to write copy while listening to prepare for the FCC code exams.

The FCC code exams are not random characters but are plain copy. If one is interested in passing the FCC code exams, working on plain copy is the proper study method to use.

Gordon West says on the cassettes, "There will be no surprises." I attest to the fact that this is certainly the case. Anyone preparing for an FCC exam, even those given by volunteer examiners, should contact Gordon West WB6NOA for the appropriate cassettes.

Earl W. Long KA0MOE
Joplin MO

READER COMMENTS: THE AUTEK QF-1A

Concerning your recent review of the Autek QF-1A audio filter, I am writing you with my own review.

As a heavy (95 percent) CW operator, the QF-1A is for me a valuable tool in bringing a signal up out of the noise. For me, the best results are obtained by using the Aux Notch control to take out QRN and then peaking the CW note with narrow selectivity to keep down QRM. Extra bonus: With the filter's audio amplifier, the CW sidetone of my HW-101 comes through very loud. A quarter-turn of Aux Notch brings sidetone levels down nicely.

I have not had a chance to use the filter on SSB very much. It seems to do a nice job in making "trash audio" fairly intelligible. The peaking of mid-range audio seems to be the best bet.

Autek's suggestions of appropriate functions for different modes/conditions are of great help in discovering how to improve audio. Their condensed list of the above (given in the instructions) I copied onto some index cards and taped to the top of the unit for quick reference.

I saw the QF-1A for the first time about 3 years ago as an SWL. After a demonstration, I told myself I had to have one. When mine came in July, 1983, I tried it out first on an SWL communications receiver. SWL fans should note: The QF-1A is a very valuable tool for cleaning up faded, choppy, or interfered-with signals. SWLs should seriously consider the unit for making their hobby more enjoyable.

The Autek QF-1A beats any other unit (as far as I can determine) in function, performance, and price. It would make a nice addition to any ham/SWL station where cleaning up a bad received signal is a concern. (I believe that covers just about everyone.) I am pleased with my unit.

Charles W. Cotterman KA8OQF
Dayton OH

KENWOOD TR-8400

Those new, smaller, more-fuel-efficient cars really put the pressure on amateur manufacturers for new, smaller, more-space-efficient mobile rigs. (I often wonder what car dealers think when the first thing I do in their showroom is survey under the dash for space availability and ease of wiring in that new prospective car.) Well, if you're into 440-MHz FM, the folks at Kenwood have sure made life easier. The TR-8400 is downright tiny. Measuring just 2" high by 5-3/4" wide by 8" deep, the radio will easily fit into even the smallest car.

But don't let the small size fool you. The 8400 is a microprocessor-controlled 10-Watt rig with memories, scanning, and all those niceties that state-of-the-art computer technology provides.

The Kenwood TR-8400.

Features

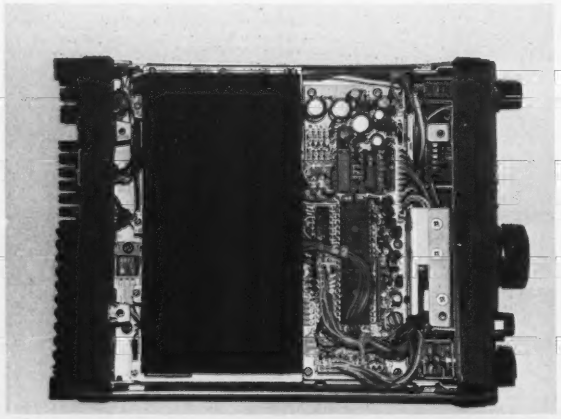
Two vfo's designated "A" and "B" step in 25-kHz increments, which is compatible with the US and Candian band plans. Five memory channels can be stored and recalled with either a five-position switch or with the scanning function. Memory 5 can be used for operation of repeaters with other than 5-MHz frequency splits. On this channel, the transmit and receive channels are memorized separately. Channels 1–4 as well as the vfo's are preset to provide a plus or minus 5-MHz split. In addition, simplex operation can be selected.

Two types of scanning are provided, memory scanning and band scanning. In the memory-scan mode, each of the five channels is scanned at a rate of 1 channel per second. Band scanning is at a much faster rate, described in the manual as 120 ms per channel (about a tenth of a second). This may seem fast, but when you are considering that the entire 10-MHz-wide band is being scanned, this rate is fine. Scanning the entire band takes only 50 seconds. If the squelch is opened by a signal, then scanning stops until the signal disappears, then scanning resumes from that frequency. If you want to listen further to that conversation, you must disable the scan function with the front-panel switch or by momentarily depressing the push-to-talk button on the mike.

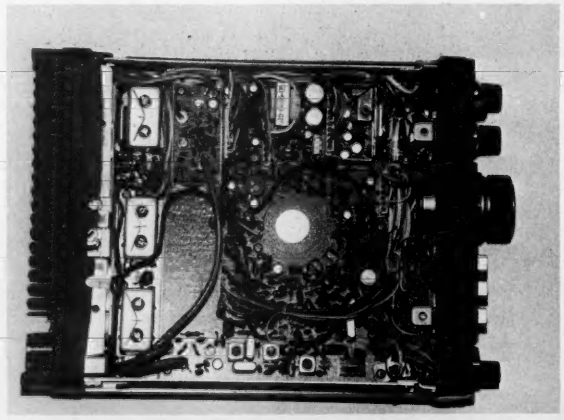
A tone switch is provided on the front panel to enable or disable either a subaudible tone or tone burst for repeaters that use this feature. It should be noted that Kenwood does not offer the actual tone module that is required, but the radio is compatible with standard products available from a number of sources; the manual even describes the installation procedure. Similarly, the TR-8400 includes an input for a separate autopatch touch-tone™ pad.

The rf power output is 10 Watts with a lower power level of 1 Watt.

One of the best features of the 8400 for me was the microphone with up/down tuning buttons. Each push of the button ad-



Top view.



Bottom view.

vanced the tuning one step, which was indicated not only by the display changing, but also by a built-in beeper. Holding down the appropriate button doubles the scan rate and is indicated by a continuous tone.

Controls, Displays, Connections

Despite the small area available on the front panel, the controls are well laid out and are easy to use. As shown in the photo, the memory-channel-selection switch appears in the upper left corner with the memory-programming and memory-recall buttons to the immediate right. The memory-recall button switches between the vfo's and the memory channels. Below are the volume and squelch controls. The main tuning knob dominates the front panel and clicks off channels in 25-kHz steps. Each revolution moves you 1.25 MHz up or down so you can move quite rapidly between band edges. When you reach the edge, the microprocessor automatically starts you at the other end of the band. With a little forethought, you quickly start to think of the band as a circle. Any frequency can be reached by tuning up or down once you know the shortest route.

To the right of the main tuning knob is a cluster of six buttons in two rows. The top row controls scanning. The SCAN and HOLD buttons start and stop the scan function, and the M.S. (Memory Scan) selects either vfo scanning or memory scanning as described earlier. On the bottom row is the vfo-select button ("A" or "B"). An LED lights to indicate when vfo "B" has been selected. A high/low power switch and the tone activation switch are also included. Above the microphone connection is a three-position rotary switch for selecting the transmit frequency shift, plus or minus, or simplex operation. A five-digit red LED numeric readout indicates frequency down to the whole kilohertz (example: 449.275 is shown as 9.275).

An LED light bar shows both rf power output and relative received signal strength. Individual LEDs indicate busy channels, transit mode, and repeater operations.

Rear-panel connections are provided for an external speaker, a tone-pad input, dc power, and an antenna.

On-the-Air Operation

I'm sure that in the design of any radio there are certain trade-offs to be considered, especially when so much is packed into such a small space. However, if there were trade-offs here, they did not affect the performance of the radio. Even the receiver-audio output was in abundance and the speaker could be driven loudly and still produce a crisp sound. Transmitted-audio reports were also excellent, and no operational problems of any sort were experienced with the radio. By far my favorite feature was the microphone with its up and down frequency buttons. Talk about being addicted to video games! After a few hours with readouts flashing and beeper beeping, I could land on a channel at will practically with my eyes closed.

I did manage to come up with a few ideas for possible future refinements. I am personally a bit partial to the use of type N antenna connectors at these frequencies and the one provided was a so-called UHF type. The digital readout is a bit difficult to see in direct sunlight, as are many others. The readout does not indicate the transmit frequency, but only the received frequency, even in the transmit mode.

Manual

The manual is very understandable with numerous pictorial diagrams. All functions and features are fully described. A block diagram and schematic are included, but there is little information regarding the circuitry. A separate service manual is available which contains this information.

Summary

The TR-8400 is both enjoyable and reliable. The features are well thought out to provide plenty of utility without a lot of complexity. This is an important consideration when selecting any mobile radio.

For more information, contact *Trio-Kenwood Communications, 1111 West Walnut Street, Compton CA 90220.*

Dave Mackey K1KA
Amherst NH

THE SUPER SANTECS

A short time ago, while discussing the no-code license proposal on a local repeater, a user with views different than mine accused me of not even knowing what time it was. He had failed to reckon with the fact that I was using a Santec ST-440/uP. By merely throwing a front-panel switch on the radio, I was able to hold my own in the conversation, as the Santec instantly displayed the correct time.

In addition to their timekeeping abilities, the Santec ST-/uP handie-talkies are lightweight, relatively compact radios with a number of innovative features. The 144- and 440-MHz versions have been in production for some time. The importer, Encomm, Inc., introduced the ST-220/uP, the world's first scanning 220-MHz handie-talkie, at the 1983 Dayton Hamvention.

Several particularly good features of these radios involve their receive sections. The radios wake up on whatever receive frequency is stored in the first memory. Each radio remembers ten receive channels, complete with transmit offsets. Santec says the tenth memory, which also serves as the upper scan limit when scanning a band, won't retain a transmit offset after the radio is switched off, but in fact it will retain simplex or negative split (transmit 600 kHz below the receive frequency), while the first nine will retain simplex, positive, and negative splits and nonstandard offsets. Non-standard splits are handled by the ability to program memory channels 2-9 to receive on a designated frequency and transmit on the frequency stored in the first memory. In memory mode, the stored offset overrides the front-panel offset switches, so you know that when you select a memory channel, you are still ready to go on channel without checking switch settings.

In the squelched receive condition, if no signal has been received for about 90 seconds, the radios go into an idle mode. Current drain decreases to about 3 mA. Every 1.5 seconds, the radios sample the receive frequency for about 250 ms. Absent a signal, the idle mode continues. Pressing the PTT bar or receiving a signal during the sampling period restores the receiver to normal. Over time, this feature results in an average receive drain (in the idle mode) of 8-10 mA, which is comparable to many non-synthesized radios.

The receivers also feature an S-curve detector, which senses discriminator output voltage. When scanning, this feature causes scanning to stop whenever the discriminator voltage goes to zero, which means right on channel instead of 5 kHz high or low. The more usual squelch detector stops scanning as soon as enough signal is received to open the squelch, which may or may not happen exactly at the desired frequency. Also, the S-curve detector makes it possible to scan with the radio unsquelched, a useful feature for detecting weak signals.

On the ST-144 and the ST-220, the scanning interval can be set anywhere between 5 and 100 kHz, in 5-kHz increments. On the ST-440, the choice of intervals is 25, 50, 75, or 100 kHz. All offer four scanning modes: *Scan,* in which the radio stops for a short interval on each received signal and then automatically restarts; *Search,* in which scan must be restarted manually after stopping on a busy channel; *Open,* in which scan stops on the first vacant channel and requires manual restarting; and *Manual,* in which scan moves one interval up or down at the press of a keyboard button or runs continuously if the button is held for about 1.5 seconds. All this applies whether the scan is of an entire band, a designated portion of a band, or the ten memory channels. Scanning the ten memories in the Scan mode activates a priority feature; channel 1 is scanned first after each stop for a received signal on any other channel.

The receivers are quite sensitive, as the receiver specifications in Table I demonstrate. 12-dB SINAD occurs between 0.23 and 0.31 uV input, depending on the radio. The receiver sensitivity measurements were made on a Motorola R2001 communications system analyzer, courtesy of Eastern Communications Ltd., of Long Island City, New York. None of the radios exhibits any receive birdies, although the ST-144 and ST-440 each had one initially. See the comments on Santec service at the end of the article.

Transmitter-power output and current consumption are also shown in Table I. The medium- and low-power levels are fully adjustable; I set mine for approximate 6-dB steps near the band centers, 146, 223.5, and 445 MHz, giving one-fourth and one-sixteenth of full power. As Table I demonstrates, output at the medium-power setting tends to increase somewhat with frequency.

All three radios are powered by a battery of 8 AA nickel-cadmium cells rated at 500 mAh. A three-pin socket wired to the battery mates with a plug inside the radio. A fifteen-hour wall charger is supplied with the radio and plugs into its underside; a small PC-board external charge adapter is an available accessory which accepts the charger plug and the battery socket, allowing a second battery to be charged outside the radio. I found another use for the charge adapter, described later. A 5-hour rapid charger/power supply is also available.

The radios all have the 24-hour clock feature that gave me such a ready retort on the repeater and an LCD frequency display with a night viewing light. The latter contains quite a wealth of information. First, all six digits of the receive or transmit frequency in use appear on the screen instead of the more typical 4 digits. (Frequency entry on the keyboard is the usual 4-digit process, e.g., 6125 for 146.125 or 446.125 MHz, except that trailing zeros needn't be entered, so 4 gets you 144.000, 224.000, or 444.000 MHz, depending on the radio). The display also shows: channel number (if you are on a memory channel) scan mode, and transmit offset as +, −, or 1 (for "transmit on the frequency in memory 1"). In memory mode, the offset programmed for each channel is displayed on the screen; in normal mode, the screen displays the offset for which the front-panel switches are set. There's a great deal of information in a small space.

The ST-144 receives from 142.000 to 149.995 MHz and transmits in all but the highest Megahertz. The ST-220 transmits and receives from 220.000 to 224.995 MHz, and the ST-440 transmits and receives from 440.000 to 449.975 MHz.

Negative comments? Only that the clock feature disables the memory mode. That is, if you are on a channel in memory, and you switch to the time display, when you return to the frequency display, you will be on the same receive frequency, but your transmit frequency will suddenly have become dependent on where your front-panel offset switches are set. Worse, every so often the switch into time display puts you back on the frequency in the first memory (as though you had turned the radio off and on again). This is rare, but it's mildly annoying when it happens.

Service on Santec radios is excellent. My ST-144 and ST-440 each had a single moderately strong receive birdie. Encomm responded to my telephone calls and asked me to send the radios back for repair. In each case, I received a postcard confirming receipt almost at once, and I had the radio back in seven days, with a work sheet showing what had been done to it. The Encomm warranty covers everything for 90 days and covers all semiconductors (excluding the output transistor) for two years; the replacement semiconductor is free, and there is a maximum labor charge of one hour at current shop rates.

I could go on to describe the installation of a memory back-up battery, a subminiature relay to disable the Santec's in-

The ST-144/uP, ST-220/uP, and ST-440/uP radios.

	ST-144/uP				ST-220/uP				ST-440/uP			
	144.0 MHz		147.5 MHz		222.0 MHz		224.5 MHz		441.0 MHz		449.0 MHz	
Transmitter power output @ 10.4 V	**W**	**mA**	**W**	**mA**	**W**	**mA**	**W**	**mA**	**W**	**mA**	**W**	**mA**
H	4.10	970	3.90	970	3.50	960	3.50	970	2.50	850	2.45	850
M	1.25	570	1.90	700	0.75	460	1.15	550	0.65	480	1.10	540
L	0.45	400	0.40	380	0.20	290	0.18	260	0.30	350	0.22	320
Receiver @ 10.4 V												
Sensitivity (1 kHz tone @ 4 kHz deviation)												
Squelch opens (minimum setting) 12-dB SINAD	0.17 uV		0.17 uV		0.20 uV		0.23 uV		0.29 uV		0.23 uV	
	0.23		0.23		0.26		0.28		0.31		0.25	
Current Consumption:												
idle (radio squelched; no signal received for at least 90 sec.)	8 mA*				8 mA*				10 mA*			
Squelched	34				34				42			
1Squelch Open (noise)												
minimum volume	54				55				52			
⅓ volume	77				80				77			
full volume	163				200				153			
Radio Off clock on	513 uA				570 uA				455 uA			
clock off	238 uA				250 uA				175 uA			

* In the idle mode, both radios draw approximately 3 mA; every 1.5 seconds current increases to the squelched value for about 250 ms as the radio listens briefly before returning to the idle state. The idle currents above are averaged over time, based on a 5/6 low, 1/6 high duty cycle.

Table 1. Specifications.

ternal speaker when the external speaker-mike is used, and the construction of a simple device to maintain peak battery life. On all three of my radios (and on one of someone else's), I have installed a PL™ encoder-decoder with switch-selectable tones. The description of that procedure takes 25 double-spaced typed pages and 10 photographs!

For more information, contact *Encomm, Inc., 2000 Avenue G, Suite 800, Plano TX 75074.* Reader Service number 485.

Robinson Markel W2IVS
New York NY

MFJ'S ECONO TUNER

In the era of media hype—when every new rig has more memories, knobs, and LEDs—it is refreshing to find a plain vanilla product. The MFJ-900, dubbed the "Econo Tuner," fits that description.

MFJ produced the Econo Tuner to fill out the low end of its line of tuners, which range up to 2-kW capability with built-in swr meter. The 900 doesn't have a meter and is restricted to a maximum of 200 W. It does, generally speaking, match your antenna to your transmitter, which is the point of these gadgets anyway.

The only controls on the 900 are the transmitter, antenna, and inductance knobs. Tune-up is simple: Load your transmitter into a dummy load, tune it up, then switch to the tuner. With the receiver on, switch the coil knob until you find the point at which signals are their loudest, then start transmitting and play with the other two controls until your swr drops to an acceptable level. Of course, transmitter and antenna controls are interactive, which can make tuning up similar to flying a helicopter for the first time, but that is a condition inherent to antenna tuners.

The inductance control is a 12-position switch connected to taps on a coil. This technique has two advantages over the use of a rolling coil. The taps allow rapid access to the coil's extremes (for when you go from 10 meters to 80 meters) and it is a cheaper method to provide a range of inductances. A roller coil forces you to rotate the tap through the entire coil to get from one end to the other.

The coil and two variable capacitors are arranged in the classic T-circuit matching network. The coil taps are evenly spaced until they reach the high end of the coil. The last two taps are spread out, to give more even control of short antennas.

Two Flavors

The 900 comes in two flavors: with a coax connector and without. The latter is most useful for mobile or portable operations or when you are stuck in an apartment with an unforgiving landlord and your antenna doubles as bedsprings. Without the PL-259 connector, you need make only two rear-pannel connections to get the Econo Tuner operational. The antenna goes to one post and a good ground goes to the other.

The good ground is a necessity, regardless of the better radiation it offers. If too much rf is allowed to float around in the tuner, the signal may arc across the plates of the capacitors—which is precisely what happened in my shack the first time I hooked up the 900.

Previous to that, I had been using a tuner with a much greater power-handling capability (although I was running low power) and this tuner passed off the loose rf without arcing. But the zapping of the Econo Tuner was a needed indication of the poor state of my ground. The sturdily-built Econo Tuner suffered this indignity without damage and performed as advertised once I had rearranged my ground.

I found that the tuner is adaptable to a variety of operating environments. It has been used on three antennas, from a random-wire to a closely-cut multiband dipole, and I have inevitably been able to find the sweet spot on my swr meter.

One of the advantages of this tuner is its small size. It measures a scant 6 × 2½ × 5¼ inches—appropriate for a limited-space shack such as mine. The case is beige with wood-grain sides, and the terminals project less than an inch from the rear panel. Although I used it at my QTH, I can easily see the MFJ-900 on the move. If you intend to stow your rig in a backpack for a little backcountry hilltopping, I would think the 900 would be your tuner of choice.

It also comes with MFJ's unusual 12-month warranty. The 12 months is not by itself of interest, but MFJ does not void the warranty for fix-it-yourselfers. If your Econo Tuner stops working and you want to dig in and repair it yourself, you may do so with MFJ's blessing. And you can take advantage of the company's technical hotline if you find yourself in too deep.

The MFJ-900 sells for $49.95. For more information, contact *MFJ Enterprises, Inc., 921A Louisville Road, Starkville MS 39759.* Reader Service number 486.

Avery L. Jenkins WB8JLG
***73* Staff**

GHOST FIGHTERS' CONSUMER GUIDE TO SATELLITE TELEVISION

Contrary to popular belief, satellite television isn't just another flash-in-the-pan fad. True, the excitement that accompanied the early days of the industry has diminished, but so have the entrance requirements. Prices are still declining, not only for antennas and receivers, but also for information. *Ghost Fighters' Consumer Guide to Satellite Television* is a good example of this trend towards economy. It provides 76 pages of information for $8.95, a far cry from the $25 price tag that many early TVRO books sported.

The Ghost Fighters manual is meant to bring you up to speed quickly on just what satellite television is and how you as a consumer can make a wise buying decision. For schematics or detailed technical data, choose another source (perhaps back issues of *73*), since this book stresses TVRO at its module rather than component level. With just a few exceptions, references to specific brands or manufacturers are avoided. Yet the book is surprisingly up to date, mentioning innovations that are in keeping with its 1983 publication date.

Most of the guide is devoted to the fundamentals of operation behind each link in a satellite receiving system. Given the author's background in antenna design, it isn't surprising that antenna selection receives heavy treatment. Other topics include the future of satellite television (including direct broadcasting) and the whys and wherefores behind three-foot dishes. Rounding out the book is an appendix that includes a listing of the 4-GHz television satellites as of early 1983 and a comprehensive glossary.

This consumer guide carries a homebrew appearance, yet features sound, conservative advice. It doesn't tell you what to buy as much as it tells you what **not to buy. For all but the most novice reader, it will probably be old hat. But if you are** starting out, the advice that this book offers could make the difference between buying a marginal system and a quality one.

For more information, contact the author, *James Anderson, Route 2, Box 136-B, Stevensville MT 59870.* Reader Service number 487.

Timothy Daniel N8RK
Oxford OH

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

FCC

Referring to the docket which eliminated logging requirements (PR Docket No. 82-726), the *Federal Register* published the following correction for Section 97.85(g)(4).

Erratum

In the Matter of Elimination of Logging Requirements in the Amateur Radio Service; PR Docket No. 82-726.

Released: June 20, 1983.

On June 6, 1983 (FCC 83-249), the Commission released a Report and Order in the above captioned proceeding. This document corrects certain typographical errors in the Appendix to that Report and Order published June 9, 1983, at 48 FR 26606. Section 97.85(g)(4) is corrected to read: "(4) The maximum transmitter output power which occurs during operation;".

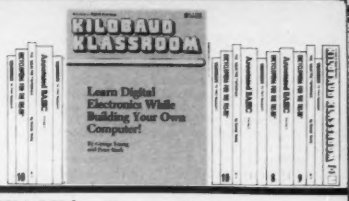
WAYNE GREEN BOOKS

KILOBAUD KLASSROOM

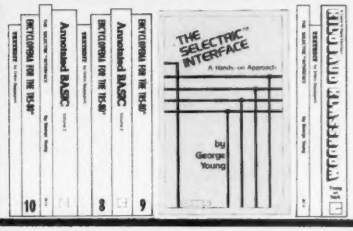
by George Young and Peter Stark

Makes learning electronics fun and easy. First published as a series in *Kilobaud Microcomputing*, the book combines the learning of essential theory with practical, hands-on experience. The course begins with basic electronic projects and culminates in the construction of your own programmable microcomputer. The direct instructional methods of authors Young & Stark make KILOBAUD KLASSROOM a simple way for you to acquire a solid background in digital electronics.

BK7386 (419 pages).....**$14.95**



THE SELECTRIC INTERFACE by George Young



You need the quality print that a daisy wheel printer provides but the thought of buying one makes your wallet wilt. The SELECTRIC™ INTERFACE, a step-by-step guide to interfacing an IBM Selectric I/O Writer to your microcomputer, will give you that quality at a fraction of the price. George Young, co-author of *Kilobaud Microcomputing* magazine's popular "Kilobaud Klassroom" series, offers a low-cost alternative to buying a daisy wheel printer. The SELECTRIC INTERFACE includes: step-by-step instructions, tips on purchasing a used Selectric, information on various Selectric models, including the 2740, 2980, and Dura 1041, driver software for Z80, 8080, and 6502 chips, tips on interfacing techniques. With The SELECTRIC INTERFACE and some background in electronics, you can have a high-quality, low-cost, letter-quality printer. Petals not included.

BK7388 (125 pages).....**$12.97**

GENERAL LICENSE STUDY GUIDE

By Timothy M. Daniel N8RK

This is the complete guide to the General License. Learning rather than memorizing is the secret. This is not a question-and-answer guide that will gather dust when the FCC issues a new test. Instead, this book will be a helpful reference, useful long after a ham upgrades to General. Includes up-to-date FCC rules and an application form. Order yours today and talk to the world.

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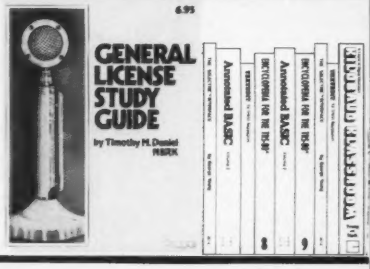

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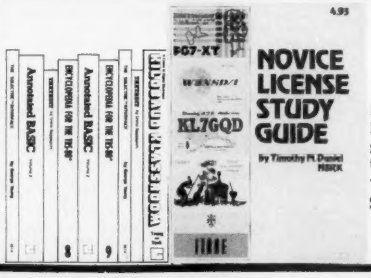

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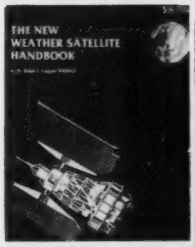

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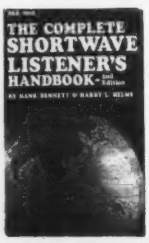

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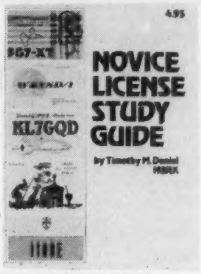

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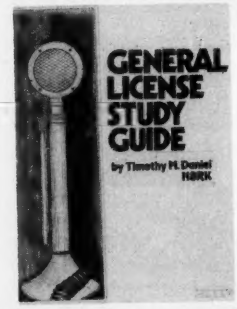

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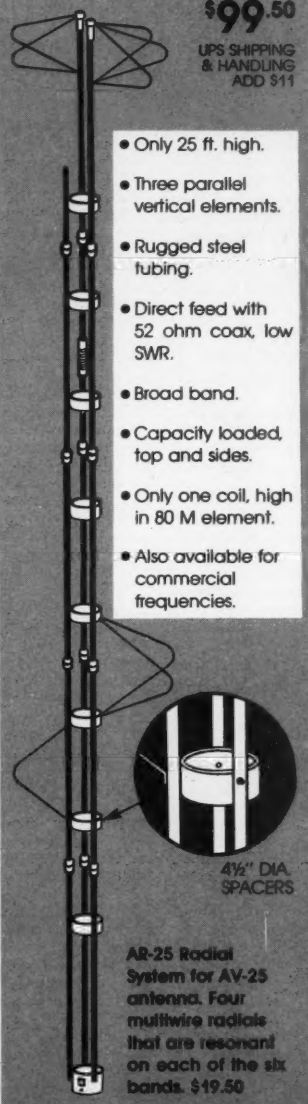

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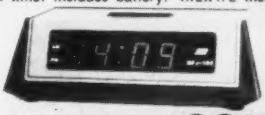

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LETTERS

TEENAGE JEWELS

Why do kids lose interest in ham radio here and not in Japan? So queried many of your editorials. Of course they lose interest, even after acquiring a license...unless we *involve* them. Kids need, more than anything, to be needed...to be acknowledged as creative, contributing human beings.

So, in Santa Cruz, California, we have a growing mob of teenagers wading into every facet of the ham-radio diamond, including through "each one teach one" classes. Our radio club has elected a teenager to take over prexy duties next year, which helps entice more young people to our meetings, and we make a point of inviting them and extending helping hands to them. When young Novices are introduced, the club enthusiastically applauds them.

We have bestowed used but usable radio stations upon two local junior high schools, assembled antennas, nurtured the responsive kids, etc. Now Del Mar Junior High is gradually focusing their whole curriculum around ham radio, school computers, and "Planetary Citizenship." A social studies teacher offers credit for study of the countries contacted through QSOs, English teachers help the kids write letters along with QSLing, and there is now a science elective for which the Novice and/or General exam is the final exam.

Kids mastering these demanding skills are rewarded by free sailing lessons and cruises on a sloop dedicated to world friendship by ham radio which cruises into foreign ports everywhere on behalf of everyone. On board, ham radio gives fun and games, stimulating ever more intense skill-mastering. For instance: You can play a lot of games with code. No one gets breakfast without asking for it in CW. (As we near Mexico, you have to ask for *huevos* in code instead of "eggs," of course.) You can stay stranded atop the mast all day unless you know how to ask in code to be cranked down. But the most motivating device is to start telling jokes about the CW laggard in code. He/she can't stand hearing others snicker mysteriously about him, so he gets code-wiser faster!

When we sail into different ports, we always get invited into schools. Our kids interview students and tape-record their ideas about whatever they are doing and plan to do about making the world work better. (We don't pretend to be gurus, knowing that real education asks more questions than are answered.)

As the word gets out and more kids realize that electronic communications via radio and computers empower them to climb right out on the cutting edge of the culture regardless of their age and rank, well...move over world, here they come!

Young people are just as hungry as ever to "put their highest powers to their highest use." Most of all, having generous, supportive older hams reach out to them encourages them to discipline themselves for skill-mastery. Then, having a school radio station or access to member stations keeps them at fever pitch.

If every ham club in this fractionating world were to sponsor a school club and see the kids through, and then turn over real responsibilities to them, such as sending traffic, field day, emergency services, etc., our ranks would solidify with youthful talent. I feel one of the reasons western culture is limping along is because we have not set a suitable stage for the creative energies of two or three whole generations. Helping our kids NOW to acquire these skills helps them to play in a major league of the World Game after their minor-league encounters with Pac-Man. I mean this letter to be a challenge!

Mary Duffield WA6KFA
Santa Cruz CA

Mary, the program sounds great, even if you answered a question I've never asked...about why kids lose interest in amateur radio. I've never known kids to lose the interest—only to not be exposed to it. Once it takes, it usually takes for life. You're exposing kids to the virulent virus of amateur radio and that's what we need. I'd sure like to see more clubs tackling local high schools and exposing the students to the best thing that can happen to them: ham radio.—Wayne.

KEEP STANDARDS HIGH

I feel that your editorial is right on the money when you talk about people with no knowledge of radio practice. But, there always were a few individuals that knew *nothing* about ham radio and were General-class licensees.

In the early 1960s, a lot of hams thought that the Technicians were mostly licensed by "friends" giving the test and "helping" them pass. There *was* a radio club that would *give* (literally) each new member the Technician exam; naturally, a knowledge of code or theory was *not* required. This went on until the FCC cut out the mail-order Techs.

I knew General-class operators that didn't know how to hook up a power amplifier to their rig without blowing out the receiver! Another General took the test *thirteen* times, each time memorizing a different part of the test.

The Bash material: Unless the FCC is composed of total morons, they have probably changed the code test twenty times since the Bash tapes reared their ugly heads. It is so easy for the FCC to make a different test for each examination date; they just use one of those computer Morse generators to type out the five-minute QSO. Having taken both the General and Advanced tests two and three weeks ago, I feel that the FCC theory test cannot be passed by memorizing. The only book that I used was a plain Q & A and some of the ARRL publications to bone up on some of the rules and regulations. In all fairness, I have to admit that I also hold a commercial radiotelephone license and have been employed in the electronics industry. My amateur days go back over twenty years, being originally licensed in 1960.

Having passed both the General and Advanced tests, I feel that the best way to pass any amateur test is to have a solid radio knowledge. With all the money they are willing to spend on the Bash materials, they could buy some parts at their local electronics store and get "hands-on" experience using diodes, resistors, LEDs, and other devices. Basic parts are cheaper than ever, and there are many breadboarding kits for experimenters. I "mastered" the code with a $150 receiver (new) and several legal pads and about two months of one hour each day. With the $150 and the $50 worth of parts, one can have three things: a lot of fun, knowledge, and a ham ticket. They can keep the receiver as a gift for a job "well done." I feel this old-fashioned way builds amateur radio *operators*, not appliance users or high-powered CBers.

Let's keep ham radio standards high and attract the type of people that this hobby deserves.

Bobby J. Levow WB2MQK
Flushing NY

SOUTHWEST SNOBS?

First of all, I'd like to commend you on your efforts to further the cause of amateur radio through the pages of *73*.

I am the recipient of a few back issues from a friend who, like myself, is not a ham—which brings me to the root of my problem.

I want very much to be a ham, but I cannot find anyone in this area to give me some assistance with learning some of the things that are required to obtain a license. I've talked with several hams in the area; I also wrote to the League, only to receive the name of a gentleman who is no longer able to be an Elmer. I've even gone so far as to get on 2 meters illegally to find some help. I talked with WB5MLZ and told him eyeball to eyeball what was going on; after several inquiries, I could obtain no adequate help. But I did get chewed out for being on the air, so I promptly got off. What's wrong with the hams in the Albuquerque area? Are they totally ignorant of the many-faceted purpose of amateur radio? Are they only interested in making DX contacts in the HF region to faraway places? What about their own community?

I have some knowledge of electronics; I've been a technician for over 7 years. I also have a copy of a publication from the illustrious Mr. Bash, but who learns anything that way? (It's not mine; I was told by another ham to study it!) I've just recently gotten an Icom 2AT HT and an Icom 22S (which doesn't work yet) and I'd like to be able to use them legally.

There are supposedly two radio clubs in the Albuquerque area. One is the Albuquerque Radio Caravan Club, an erstwhile group whose claims to fame are the 147.060 repeater on Sandia Peak and the fact that they sponsor the amateur station at the VA hospital. The other group is the Upper Rio Grande Valley VHF Society which sponsors repeaters on 146.94 and 146.97 (They are lovingly referred to on the .06 machine as the Upper Rio Grande Valley Snob Society.) From all that I've heard while monitoring all three of these repeaters and others around here, it seems that the pet name applies to most of the hams in the area.

I have an extreme interest in becoming a ham and will work hard to do it soon, even if it means having to go to Denver for the test. I am also interested in meeting new friends, sharing ideas, and being the best ham I can, and I won't hesitate to help someone else become a ham if he's interested. I wouldn't want anyone to receive the reception that I got.

I do agree with you, Mr. Green, that amateur radio does need new blood and I'm all for the individual radio clubs handling licensing (but let's do it honestly—no $100 favors). But I disagree on dropping the code requirement. To do that would, in my opinion, open the doors to some pretty poor operators on the bands. We've got to have something to separate the wheat from the chaff. I do agree on lowering the code speed for the General license to 10 wpm and raising the Tech qualifications to 7 wpm. I myself would like to get up to 20–25 wpm before I get my General.

I also have an interest in computers and their relationship to ham radio, and I'm also an avid builder of many projects. By the way, my wife is also interested in becoming a ham.

Anyway, the whole point of my dissertation to you is that I need some help and can't find any willing people to give it.

Maybe I won't make many friends in the Albuquerque area by this letter, but maybe it will scare some serious hams out of the woodwork around here. At any rate, I'll monitor the HF bands on my general-coverage receiver and VHF on the HT until someone cares enough to give me a call. My number is (505)-881-2166.

Keep up the fantastic work, Wayne.

Leo Francis Fearon II
2933 San Mateo NE
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Getting to the license, I really don't understand what the big deal is. If you get our code tapes, you'll learn the code just as have a hundred thousand other hams. If you get our Novice Study Guide, *you'll learn enough theory to pass the written exam. So what do you need more than that? You might want to trade in your HT for a low-band rig since it's likely that your welcome on two meters in Albuquerque may be less than enthusiastic. One thing you should understand about repeater groups: The chaps who were open and friendly and talked with anyone were years ago pushed off the repeaters and are, for the most part, a dead species. They were replaced by a surprisingly small contingent of endless talkers who talk only to each other and tune a deaf ear to casual visitors to the repeater or to newcomers. A recent survey of New England repeaters showed that of the 437 known repeaters in the area, only eight are active—and they are domineered by seventeen hams. The other 26,000 licensed New England hams account for less than 1% of the repeater use. But even in the heyday of repeaters, when there were thousands of users, unlicensed visitors were not appreciated, no matter how good the intentions. "You say your house is on fire and you and the family are trapped on the third floor? Well, that's okay, but I missed your call. Please identify yourself. You know it's illegal to use a ham rig without a license."—Wayne.*

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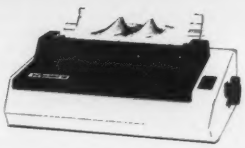

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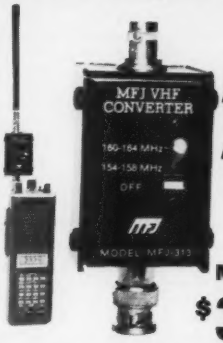

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the Army, Navy, Marines, Air Force, to remote Coast Guard stations, and to Armed Services YMCAs, USOs, servicemen's centers, etc.

One letter we received, read: "The members of the -th Maint. Co. would like to express their gratitude for all the mail received under the Christmas Mail Call program. Many of our young soldiers received very little mail during the past holiday season. They were very pleased to go to the mailroom and find. . .mail from across the United States."

The 9th Annual Christmas Mail Call is now underway. This is an ideal project for individuals as well as families and groups and is an exceptional opportunity for letting our young military people know that we have not forgotten them, that we are thinking of them—especially at Christmas when many will not be able to be with their families but will be on duty at bases and posts across the US and around the world. (Mail was sent last year to the Marines in Lebanon as well as to the US peace-keeping forces in the Sinai.)

For information on how you, your family, or your organization may have a part in this unique program, please send a self-addressed, stamped envelope (business-size, if possible) to: Armed Forces Mail Call, Box Q, Holloman Air Force Base NM 88330 (and mention that you read about Mail Call in *73*). Thank you!

Lee Spencer
Holloman AFB NM

SURGE PROTECTION

Several letters and calls have been received from hams who have had trouble finding surge protectors in their local electrical supply houses. My article in the February issue of *73* describes these devices; however, not wanting to endorse any manufacturer, I did not mention any trade names. For those who may have trouble finding one locally, here are some catalog numbers:

- Square D Company—J 9200-10 Secondary Surge Protector.
- General Electric Company—TLP-175 Lightning Protector.
- Delta Company—LA-302 Lightning Arrestor.

With these numbers, one should be able to locate one in any of the larger cities.

Robert R. McKay N8ADA
Dayton OH

HISTORIC THROWBACK?

After reading your last editorial (July, 1983), I really hope that the status-quo code proponents are not winning. I have been watching the emergence of the no-code license with considerable interest over the years and feel that it is long overdue—but then, I felt that way when I got my license 20 years ago. Even back then the rationale for why an aspirant must demonstrate a manual skill at one archaic form of communications never made much sense. After all, one did not have to demonstrate the ability to use proper grammar to be able to use phone, take a typing test for teletype, or even a screen test to use television. Code always seemed to me to be a throwback in history—"I/we had to suffer through it, and so do you." Somehow, that mentality has miraculously been allowed to survive. I deeply feel this stone-age philosophy is *the* tragedy for ham radio.

Speaking personally—which is hard not to do on such an emotional subject—I'll list my personal observations and those of some people close to me who are not hams. To me, ham radio has probably been one of the strongest driving influences in my life. I can trace practically every major thing I have done back to it in some way.

I got my first license as a teenager in junior high school. A Technician license—to me there was no greater gateway to the exploration of the world of electronics than that license. From the start, I was fascinated by UHF and microwaves, so the lack of HF privileges has never meant much to me—at least with the Extra code-speed test. This has been true for all these years, so that first license I earned at the tender age of 14 is still the one I hold now, although I since have earned commercial-class radiotelephone licenses. I remember that ham license as my passport to learning in high school. While others were busy with sports, I was designing UHF transverters and dreaming of college.

I went to college and have never really left. I earned several undergraduate and graduate degrees in the hard and social sciences and medicine and am now in my third year of dental school. I sometimes wonder what I would have done if I'd not had ham radio as an outlet to explore science as a younger person. In the meantime, between schooling, I've worked as an engineer for a large university, designing microwave meteorological sounding devices, as an archeologist in Central America, and as a scientist at a medical school—to name a few jobs.

I've also been a day laborer more times than I can remember, always supporting myself by the sweat of my brow. And somehow, I've managed to travel the world.

The point of all of this is that I have had a chance to meet a great cross section of people from varied and diffuse backgrounds. Whenever the subject of ham radio is brought up, it nevers fails to excite an interest. When CB was big, everyone thought the two were the same. I was always explaining the difference, and with that difference, the excitement I felt about ham radio. Now, with few exceptions, these were interesting, intelligent, mature people, people that would be a charming asset to any organization. I see in them all the ability to bring to a group an enlivening vitality that few could not help but feel would make a positive contribution to any field—especially ham radio. I have never understood why, to be a real ham, you must be interested only in ham radio. So much better is the ham with a broad background who can bring these outside interests into ham radio.

But time and again, after detailing the positive aspects of my hobby, they would ask about the license requirements, and time and again the code was the turn-off. I never ran into anyone objecting to the technical exam; they could understand its need and felt sure they could master that aspect of the license. But they always asked me "why do I have to learn the Morse code?" I couldn't and still can't answer. Another asset is lost.

Others who are still determined to experiment with radio, I steer to FCC Part 5 on Class A CB. It is possible to do plenty of experimenting and radioing outside hamdom—but what a loss to our hobby!

I strongly feel that unless we can get people into ham radio at a level that is less than "perfection" and can grow within the hobby, that we will witness the decline and eventual death of ham radio before too long. There are too many people interested in our frequency bands and too many other outlets for young, probing scientific minds.

It is infuriating how time and time again that initial spark that could grow into a valuable addition to ham radio is squashed by that infernal code. Over and over, they have told me "I have better things to do with my time than learn Morse code."

Sure, we have a simple entry-level license: Novice class, and it is a joke. They are allocated slivers of bandwidths in high-QRM bands and forced to read code. Code! When the whole world speaks through computers, over satellites, and through goodness knows what other wonders, someone is honestly expecting to interest an intelligent, inquiring mind in an entry-level license for the exciting (?) world of ham radio where they have to chirp out a conversation over radio Moscow on 40 meters?! Until this all changes, ham radio is in trouble.

Wayne, please keep up the fight. You are right, like you were about FM and are about computers. I just wanted to let you know some of us do indeed agree with you and appreciate your foresight and efforts.

Larry Jack KL7GLK
Annapolis MD

UNFAIR REVIEW?

The July, 1983, issue of *73*, Mr. Jenkins, carried your review of our Radio School beginner tape course. I would like to discuss this review with you for further edification about our code-training program. Your opinionated review contains several misstatements which I would like to correct. Your review also does great disservice to anyone attempting to bring more young people into the ranks of amateur radio.

First of all, get my callsign correct. It is WB6NOA.

Your statement that the character speed per individual letter is slower than 10 or 15 wpm for our beginner tapes is not correct. Our tapes were generated by the same computer specifications that the Federal Communications Commission outlined in their CCITT Recommendation R.140. Our beginner 5-word-per-minute characters are sent at exactly 13 words per minute with longer spaces in between each character to slow down the speed to 5 wpm. We agree with you that students should learn the characters at an initial higher (13 wpm) character speed so that they do not need to relearn the letters while tackling the General-class license.

Your purely personal statements about random letters versus sentences should not have entered into an objective review about the code-learning process. Our tapes specifically train students to learn how to send and receive code over the air, and to pass typical over-the-air FCC-type QSOs. Although random letters certainly are harder to memorize, our tape courses are designed so that the students should have to only play each individual cassette three or four times before going on to the next one. When the student is beginning to memorize one cassette, that's a signal to go on to the next one. This is precisely why we have four individual cassettes, each 1½ hours long, as opposed to a single tape cassette, in learning the code.

Our code-teaching techniques have been tried and proven to over 4,000 graduates of our college classes here on the West Coast. We watch the students progress through the tapes and monitor their progress carefully. Your personal observations are obviously not based on actual classroom instruction.

As a fellow journalist, I would caution you from taking the high and mighty approach to objective product evaluation. Unless you are an acclaimed code-teaching expert, your opinions and observations in print are only one man's view of a product. Did you try it in a classroom situation? Did you give the tapes to the kid down the street who had been struggling with the code, and did you follow up to see whether or not these tapes kept his interest? Are you aware of the popularity of stereo cassette players that kids take with them everywhere? Have you actually tried listening to the tapes while going to work to fully appreciate the second-track narrated channel?

Your review should never have been printed because it is purely a personal evaluation of a code-learning concept that you, as an old-timer, might not like. I would remind you that your publisher (if you really are on the staff of *73*) has long preached the need for getting more kids into ham radio. This fresh new approach of code learning is indeed working in getting kids to listen to the tapes.

After all, one of the hardest parts of learning the code is simply keeping an interest in practicing every day. You missed that one completely in your personal review of our product—you failed to mention that these tapes were indeed "different" than other tapes and that they do keep a person's interest to continue playing them on a daily basis.

Mr. Jenkins, as a journalist, you are a discredit to the art of properly evaluating a product in print. I have probably logged thousands of words more than you in print, and I would hope that you would take some friendly advice and know what the hell you are talking about before sitting down at your typewriter and tearing down a proven code-learning method that could very well lure more kids and adults into ham radio.

You obviously didn't even get to the last tape—it specifically prepares students to pass their FCC Novice-class test by duplicating the exact tone and dit-dah ratio, and using similar type format material to that which the FCC uses. If the Novice applicant chooses to be tested by a fellow amateur radio examiner, there are several messages that meet FCC-published specifications that the examiner might draw upon. You also failed to mention that we have complete code courses for the new volunteer examiner that meet published FCC specifications for all levels of licensure.

Any time you are out here on the West Coast, please don't hesitate to stop by one of our evening college classes. Here you will see the new generation of amateur radio operators. These are positive-thinking people that get the best out of any product offered. Rather than sitting back and taking pop shots at equipment or magazines or writers that they might not care for, each of our students concentrates on the positive and gets the best out of what amateur radio writers, manufacturers, and instructors have to offer.

You should sit in on one of our classes—you very well could learn something and also a fresh approach to a positive outlook on anything that will assist more people into joining the ranks of amateur radio.

Gordon West WB6NOA
Costa Mesa CA

I appreciate your comments and would like to assure you that there was no intent to belittle you or your product in my review. Although you seem to have focused on the negative comments, I did applaud the production and organizational features of your tapes, which I felt were done very well.—Avery Jenkins WB8JLG.

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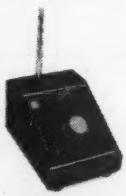

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MALPELO ISLAND

Off the west coast of South America, in the general direction of the Galapagos Islands, the tiny island of Malpelo rears from the Pacific. This uninhabited rock is far enough from the coast of Colombia to qualify as a separate "country" under DXCC rules. So Malpelo attracts an occasional DXpedition. Such a trip is scheduled for this month.

The island of Malpelo has been steadily moving up the list of the most-wanted DXCC countries, since the last DXpedition several years ago. Malpelo even entered the Top Ten in 1983. But Colombia restricts access to Malpelo, so they won't have to rescue stranded DXpeditioners off the rock. A fortuitous combination of circumstances opened the door to Malpelo this year.

The national amateur radio society of Colombia, the Liga Colombiana de Radioaficionados (LCRA), is celebrating its 50th anniversary this year. And a high government official, who happens to be a ham-radio operator, has secured the assistance of the Colombian Navy for transportation and logistical support.

This assistance should facilitate a long-time goal of Malpelo DXpeditioners: a radio station on the top of the island. The only landing area on the entire island is a small "beach" on the southeastern corner. High cliffs surround this "beach," which actually is a steeply sloping pile of loose rocks. Even climbing to the top of the island is a formidable task. Carrying radio equipment, antennas, generators, and fuel is out of the question. So previous DXpeditions have operated from the beach, much to the chagrin of West Coast and Japanese DXers. For the enormous bulk of the island blocks the beach radio communications to the north and northwest: W6 and 7 and JA.

The magnitude of this problem can be seen from the "most-wanted" statistics from *The DX Bulletin* (306 Vernon Avenue, Vernon CT 06066). In 1982, Malpelo was the 11th most-wanted country overall. However, many more West Coast and JA DXers need HK0. Malpelo ranks as 4th most wanted in W6, 2nd in JA, and 1st in W7, ahead even of China! On the other hand, Malpelo ranks only 16th among W4 DXers. A station on top of the island, without enormous cliffs in the way, would be a godsend to the Pacific DXers.

The LCRA is taking precautions in case the Navy helicopters are unable to set up a station on the top (see why having the Navy on your side helps?). The LCRA operators have been soliciting propagation information, schedules, and frequencies for those parts of the world which especially need a Malpelo QSL card. DX clubs and individuals have sent suggested operating schedules and bands to make the best use of the 5 planned days of operation. With careful planning and cooperation from other amateurs, the LCRA group could handle much of the demand for Malpelo even from the beach.

The details: The DXpedition is sponsored by the Liga Colombiana de Radioaficionados in coordination with the Colombian Navy. The amateurs will all be LCRA members, all HK licensees. The callsign will be HK0TU, QSL via HK3DDD. Projected frequencies are CW—1825, 3505, 7005, 14025, 21025, and 28025; SSB—1825, 3795, 7085, 14185, 21295, and 28595. Satellite and 2-meter gear will be along as well.

The Colombian amateurs are keeping busy during the 50th anniversary of their national society. In addition to their Malpelo DXpedition, LCRA is sponsoring a special certificate to amateurs who work Colombian stations with 5K and 5J prefixes in 1983. Work any 8 5K or any 8 5J prefixes (they can't be mixed) and send copies of the QSLs to LCRA, PO Box 584, Bogota, Colombia, for the free certificate.

Our thanks to Fred Laun K3ZO (see photo) for this information.

SPRATLY CONTINUED

The rescue of Baldur DJ6SI (see this column, last month) and the other survivors of his ill-fated DXpedition did not end the story of Spratly, 1983. First, there were the mysterious CW signals, without callsign, saying that Baldur's group had been picked up by a Russian submarine. Some Southeast Asian amateurs fear a radio hoax, one with the element of fun removed. More serious, however, was the reaction of the German press to the disaster.

The sudden, unexplained disappearance of a government counterespionage agent (for such was Baldur) attracted the attention of the press quickly, enough so that Baldur's wife is afraid to go outdoors. But the problem multiplied when the survivors were finally pulled from the sea.

German "experts" said the group could not have survived almost ten days in the uncovered dinghy, because of the high temperatures and the lack of water, food, and clothing. These experts noted the remarkably good physical condition of the four survivors and suggested that they had had something to eat in the past ten days.

The rumors of cannibalism coupled with the strange-sounding mission of this counterspy whipped the German press into a frenzy, and Baldur and his family were hounded at every turn. The rumors are, of course, nonsense.

"Experts" might suggest the survival time of an "average" citizen in similar conditions, but they cannot state that the party could not have survived. Thousands of survivors of torpedo attacks in the North Atlantic will attest that survival at sea in a small boat is more a matter of mental attitude and common sense than the dictates of experts.

And Baldur's group took great care to increase their chances of survival. Knowing that dehydration was the most serious problem, the group poured seawater over their bodies, to reduce their temperatures and decrease the body water lost through sweating. They carefully avoided drinking any seawater, which actually dehydrates the body and can be fatal if taken in the late stages of dehydration. The members of the DXpedition avoided unnecessary talking and kept their lips pressed together, to reduce water loss through the mouth. They conserved their energies, not wasting effort in rowing, flag waving, or other emotionally satisfying but unproductive activities.

In short, they did exactly what they had to do to survive: conserved their slender resources as long as possible. Four of the five who entered their dinghy survived the ordeal, and Gero DJ6EI, who didn't make it, was the least physically fit in the group.

Nevertheless, the nonsense continued, much to the chargrin of Baldur and his family. And he is still out the cost of all the equipment, without a word out of the Vietnamese government, not to mention the tragic loss of life.

The "Other" Spratly DXpedition

Meanwhile, while the controversy surrounding the DJ6SI DXpedition rages, another amateur group made an assault on Spratly, somewhat more successfully. In early May, Chito Kintanar DU1CK hitched a ride with the Philippine government to a Philippine-controlled island in the Spratly group, Thitu. This island is under the claimed and actual control of the Philippine government, as indicated by the well-maintained airstrip. Because Thitu is so close to the main group of Philippine islands, any amateur radio operation from Thitu would count for DU-Philippines, not Spratly.

But Chito didn't operate from Thitu. He pushed off in inflatable rubber rafts with a pack of scientists and motored to an island off Panata Cay. The stated purpose of the trip was the establishment of a wildlife preserve, especially for undersea life. Chito went along to provide emergency communications from the remote cay—and to make an occasional DX contact in the absence of an emergency.

Chito did indeed get radios and antennas to the island in the Spratly group and did make some radio contacts from the island. Limited antennas and generator problems restricted the operation to list-style, often controlled by DU9RG. A couple thousand amateurs, mostly in Asia, worked 1S1CK.

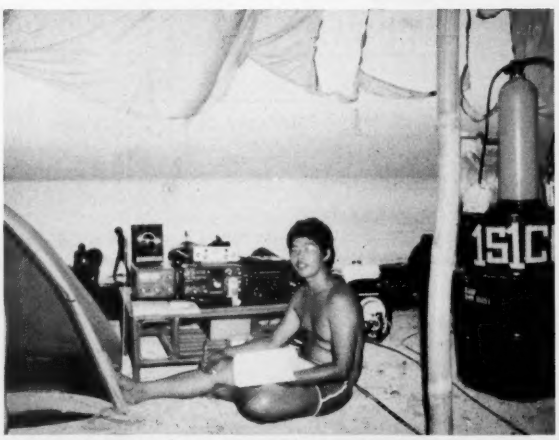
Some amateurs feel the operation should count only for the Philippines, as the Philippine government provided the transportation and "protection" of the party from start to finish. While the island where Chito operated was technically "unadministered," it was clearly under the control of the Philippine government while Chito operated, and thus should not be considered Spratly.

On the other hand, the Philippine government declined to issue a DU license or callsign for the island, citing "international repercussions." On this basis, Chito claims the use of the unofficial "1S" prefix and hopes his DXpedition will count for Spratly, not the Philippines.

Whatever the outcome of the debate as to which DXCC "country" Chito was in, Chito says he will be back again before the end of 1983, World Communications Year. A few more lucky amateurs might be able to put a 1S1CK QSL card on their wall (see card).

Meanwhile, all is not quiet on the home

Fred Laun K3ZO (left) with Harvey W2IYX, editor of the Long Island DX Bulletin. *Fred announced the Malpelo DXpedition this month.*



Chito DU1CK operating 1S1CK from just off Panata Cay, in the Spratly group.

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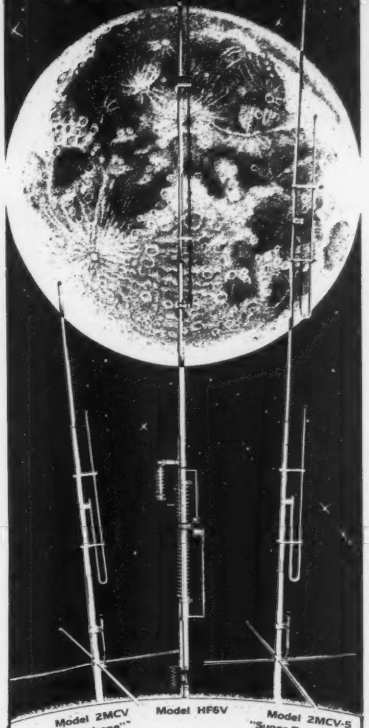

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SD1441	(F)	150W	130-175	83.50
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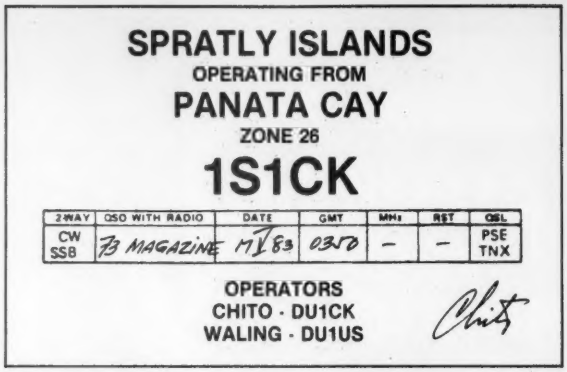

A few lucky amateurs "got on the list" and worked 1S1CK this May. Will it count for DXCC credit for Spratly?

front. In the wake of the disastrous Spratly Island trip by Baldur DJ6SI, several prominent DXers began calling for the deletion of DXCC credit for the Spratly Islands. Deletion of DXCC credit for the Spratly Islands would eliminate any incentive for amateurs to operate from the islands.

Reaction to the proposed deletion of credit for Spratly was as expected: those amateurs who had a Spratly card on the wall were totally against the idea; those amateurs who still had Spratly on their "wanted" list would be pleased to see the credit deleted. The latter group would have one less country to work, should credit for Spratly be eliminated. In fact, an amateur could actually get on the Honor Roll as a result of such an action, without working anyone!

Here's how it works. In the summer of 1983, the DXCC country count stood at 315. To be on the Honor Roll, an amateur must have at least 306 confirmed DXCC credits. The elimination of Spratly would lower the current country count to 314, and the Honor Roll cutoff to 305. An amateur who had 305 countries confirmed (but not Spratly) would gain Honor Roll status through the back door, without even entering his shack! Such are the absurdities of the ARRL DXCC Honor Roll!

Why delete credit for Spratly? Many members of the DX community were shocked by the deaths of the two West Germans during the DXpedition attempt, shocked enough to suggest removing the major incentive for amateurs to visit that corner of the South China Sea.

On the other hand, those who wanted Spratly retained (including many Californians, with Spratly cards on the wall) argued that DXCC credit should not be withheld simply because radio operation there was dangerous, or because of transportation difficulties. After all, amateurs have met and surmounted such obstacles to DX for years, and the deaths of two amateurs, although regrettable, was no reason for deletion.

The pro-deletion amateurs, unable to use their real reason, fell back on deletion for reason of "significant change in administration." In other words, Spratly, which used to be a scattered assembly of worthless islands, should not now be a DXCC credit because the surrounding countries have taken a sudden interest in possible oil deposits under the island group.

The pro-delete amateurs, including those who have worked Spratly, and thus have nothing to gain, do have a point. The Spratly of Don Miller's day is a far cry from the heavily armed and vigorously protected islands today. But if we were to delete every country which has undergone a "significant change in administration," we would have to delete dozens of DXCC countries.

Whatever the outcome of the decision, for or against deletion, Spratly will remain a very special place for radio amateurs. The Spratly group has been the site of more trouble and controversy than any other such archipelago. Yet there is no question that any signal with a 1S prefix will command attention on the DX bands.

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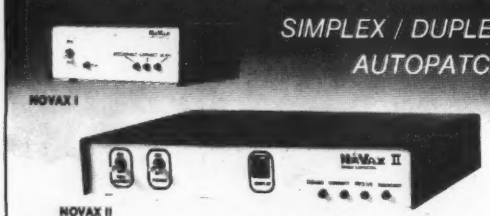

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FCC

Calling the current regulations "archaic" and "unsuitable," the FCC changed the rules defining amateur transmitting power and how it is measured. Instead of input power, the new regulations call for the measurement of power output. Maximum power out is restricted to 1500 Watts.

Parts 2 and 97 of the Commission's Rules and Regulations, 47 CFR Parts 2 and 97, are amended as follows:

PART 2—[AMENDED]

§ 2.106 [Amended]

1. In § 2.106, under the heading "NG FOOTNOTES," the heading of the table in Footnote NG 15, paragraph (a)(4) is revised from "Maximum DC plate input power in watts" to read "Maximum transmitter peak envelope power output in watts".

2. In § 2.106, under the heading "U.S. FOOTNOTES," Footnote US7, the introductory paragraph is revised to read as follows:

US7 In the band 420–450 MHz and within the following areas, the peak envelope power output of a transmitter used in the Amateur Radio Service shall not exceed 50 watts, unless expressly authorized by the Commission after mutual agreement, on a case-by-case basis, between the Federal Communications Commission Engineer-in-Charge at the applicable District Office and the Military Area Frequency Coordinator at the applicable military base:

* * * * *

PART 97—[AMENDED]

3. In § 97.3, paragraph (t) is revised to read as follows:

§ 97.3 Definitions.

* * * * *

(t) *Transmitting power.* The radio frequency (RF) power generated by operations of an amateur radio station, including the following:

(1) *Transmitter power.* The peak envelope power (output) present at the antenna terminals (where the antenna feedline, or if no feedline is used, the antenna, would be connected) of the transmitter. The term "transmitter" includes any external radio frequency power amplifier which may be used. Peak envelope power is defined as the average power during one radio frequency cycle at the crest of the modulation envelope, taken under normal operating conditions.

(2) *Effective radiated power.* The product of the transmitter (peak envelope) power, expressed in watts, delivered to an antenna, and the relative gain of the antenna over that of a half-wave dipole antenna.

* * * * *

4. Paragraph (b)(2) and the introductory paragraph of (b)(7) of § 97.61 are revised to read:

§ 97.61 Authorized frequencies and emissions.

* * * * *

(b) * * *

(2) Operation shall be limited to:

* * * * *

(7) In the following areas, the peak envelope power output of a transmitter used in the Amateur Radio Service shall not exceed 50 watts, except when authorized by the appropriate Commission Engineer-in-Charge and the appropriate Military Area Frequency Coordinator:

* * * * *

5. In § 97.67, the section heading and paragraphs (a), (b) and (d) are revised, and paragraph (f) is added, to read as follows:

§ 97.67 Maximum authorized transmitting power.

(a) Notwithstanding other limitations of this section, amateur radio stations shall use the minimum transmitting power necessary to carry out the desired communications.

(b) Each amateur radio transmitter may be operated with a peak envelope power output (transmitter power) not exceeding 1500 watts, except as provided in paragraph (e) of this section. Other limitations of this section and § 97.61 also apply.

* * * * *

(d) The peak envelope power output (transmitter power) of each amateur radio transmitter shall not exceed 200 watts when transmitting in any of the following frequency bands:

(1) 3700–3750 kHz;

(2) 7100–7150 kHz (7050–7075 kHz when the terrestrial location of the station is within Region 1 or 3);

(3) 21100–21200 kHz;

(4) 28100–28200 kHz.

* * * * *

(f) An amateur radio station may transmit A3 emissions on or before June 1, 1990 with a transmitter power exceeding that authorized by paragraph (b) of this section, provided that the power input (both radio frequency and direct current) to the final amplifying stage supplying radio frequency power to the antenna feedline does not exceed 1000 watts, exclusive of power for heating the cathodes of vacuum tubes. Limitations of paragraphs (a), (c) and (d) of this section and limitations of § 97.61 still apply.

6. Paragraph (d)(6)(ii) of § 97.77 is revised as follows:

§ 97.77 Standards for type acceptance of external radio frequency (RF) power amplifiers and external radio frequency power amplifier kits.

* * * * *

(d) * * *

(6) * * *

(ii) No amplifier shall be capable of amplifying the input RF driving signal by more than 15 decibels. (This gain limitation is determined by the ratio of the input RF driving signal to the RF output power of the amplifier where both signals are expressed in peak envelope power or mean power.) If the amplifier has a designed peak envelope power output of less than 1,500 watts, the gain allowance is reduced accordingly. For example, an amplifier with a designed peak envelope output power of 500 watts shall not be capable of amplifying the input RF driving signal by more than 10 decibels.

Areas	Maximum transmitter peak envelope power output in watts			
	1900 to 1925 kHz, day/night	1925 to 1950 kHz, day/night	1950 to 1975 kHz, day/night	1975 to 2000 kHz, day/night
Maine, Massachusetts, New Hampshire, Rhode Island	150/35	0	0	150/35
Connecticut, Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania, Vermont	300/75	0	0	300/75
Kentucky, North Caroline, Ohio, South Caroline, Tennessee, Virgina, West Virgina	750/150	0	0	750/150
Florida, Georgia, Illinois, Indiana, Michigan, Wisconsin	750/150	150/35	150/35	750/150
Alabama, Arkansas, Iowa, Minnesota, Mississippi, Missouri	1500/300	300/75	300/75	1500/300
The remainder of the States and Territories	1500/300	1500/300	1500/300	1500/300

In an attempt to clarify the rules covering business communications in amateur radio, the FCC amended portions of Part 97. According to the Commission, the prohibition against business use was implied in the rules, but limits were not explicitly defined. The FCC's modification, as it appeared in the *Federal Register*, is reprinted below.

PART 97—[AMENDED]

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

1. In § 97.3, a new paragraph (bb) is added, after paragraph (aa), as follows:

§ 97.3 Definitions.

* * * * *

(bb) *Business communications.* Any transmission or communication the purpose of which is to facilitate the regular business or commercial affairs of any party.

2. In Subpart E of Part 97, entitled Prohibited Practices and Administrative Sanctions, a new § 97.110 is added, prior to § 97.112, as follows:

§ 97.110 Business communications prohibited.

The transmission of business communications by an amateur radio station is prohibited, except for emergency communications as defined in this part.

3. In Subpart E of Part 97, entitled Prohibited Practices and Administrative Sanctions, a new § 97.111 is added, between new Section 97.110 and present § 97.112, as follows:

§ 97.111 Limitations on international communications.

Transmissions between amateur radio stations of different countries, when permitted, must be limited to messages of a technical nature relating to tests, and, to remarks of a personal character for which, by reason of their unimportance, recourse to the public telecommunications service is not justified.

4. Section 97.114(c) is amended by deleting the second sentence thereof. As amended, § 97.114(c) reads, as follows:

§ 97.114 Third party traffic.

* * * * *

(c) Except for emergency communications as defined in this part, third party traffic consisting of business communications on behalf of any party.

As of August 31, 1983, the mail-back procedure for Novice examinations was eliminated by the FCC. The Commission's Final Order was adopted June 29, 1983, and amends the amateur regulations as follows:

Appendix A

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

1. The heading and paragraph (b) (1), (2) and (3) of § 97.28 are revised to read, as follows:

§ 97.28 Examination administration.

* * * * *

(b) Unless otherwise prescribed by the Commission, each examination for the Novice Class operator license shall be administered by a volunteer examiner. Each written test for the Novice Class operator license shall be prepared by the examiner from PR Bulletin 1035A (latest date of issue), entitled *Questions for the Element 2 Amateur Radio Operator License Examination.*

(1) When the applicant successfully completes examination Elements 1(A) and 2, he/she shall submit an application (FCC Form 610) to the Commission's office in Gettysburg, Pennsylvania 17325. The application shall include:

(i) The name and mailing address of the volunteer examiner administering the examination;

(ii) A description of the volunteer examiner's qualifications to administer the examination;

(iii) The volunteer examiner's certification that the applicant has passed telegraphy Element 1(A) and written test Element 2;

(iv) The signature of the volunteer examiner administering the examination.

(2) Each volunteer examiner must:

(i) Hold a current General, Advanced or Amateur Extra Class operator license issued by the Commission;

(ii) Be at least 18 years of age;

(iii) Not be related to the applicant;

(iv) Not be in an employer-employee, or employee-employee, relationship with the applicant; and

(v) Not own a significant interest in, or be an employee of, any company or other entity which is engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparing for obtaining amateur station operator licenses.

(3) The volunteer examiner administering the Novice examination shall be responsible for the necessary supervision of the examination. A copy of the applicant's written examination papers must be retained in the volunteer examiner's station records for one year from the date the examination is administered.

* * * * *

2. Section 97.31(b) is revised to read as follows:

§ 97.31 Grading of examinations.

* * * * *

(b) Seventy-four percent (74%) is the passing grade for written examinations. Each element required for a particular license will be graded separately. Commission personnel will grade the written examinations, except the Novice Class Element 2 written examination, which will be graded by the volunteer examiner administering the examination.

Appendix B

Until FCC Form 610 is revised to include the certifications required by Section 97.28(b)(1), the statement on the current edition of Form 610 (December, 1981) must be modified. This should be done by writing in the appropriate underlined words as shown below:

Certification

I Certify That:

1. I am unrelated to the applicant (i.e. not a spouse, parent, child, stepchild, sister, brother, aunt, uncle, niece, nephew, grandparent, grandchild, in-law, stepbrother, stepsister, stepmother, stepfather.)

2. I am at least 18 years of age.

(3.) *I have examined the applicant and he/she has passed Element 2.*

(Check One)

☐ I have examined the applicant within the past 10 days and he/she has passed the five words per minute telegraphy examination.

☐ I have examined the applicant *in Element 1(A),* since he/she claims telegraphy test credit. The original FCC Form 845, Code Credit Certificate, is attached.

☐ I have not examined the applicant *in Element 1(A),* since he/she claims telegraphy test credit. Applicant's statement is attached giving the license number, expiration date, and class of commercial radiotelegraph operator license which qualifies him/her for credit.

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- Cassette or Disk, only $18.95 ppd.

PROCAST P.O. Box 682, Dept. H Millersville, MD 21108
↙38

ANNOUNCING 73 CLASSIFIEDS

BARTER 'N' BUY

Beginning with the December issue, *73* will accept classified advertising. Individual and non-commercial rates—15¢ per word; commercial rates—50¢ per word; prepaid by check or money order. Ads must pertain to amateur radio products or services, and must be submitted typewritten, doublespaced, 100 words maximum. Include full name and address in ad; telephone number optional. Copy must be received in Peterborough by the 5th of the second month preceding cover date. Example: December issue ad must be in our hands by October 5th. Ads received after deadline will be run in the next issue. Direct all material and inquiries to:

BARTER 'N' BUY
73 ADVERTISING DEPARTMENT
Elm Street, Peterborough,
New Hampshire 03458.
Telephone: (603) 924-7138

TEN FM

JOIN THE FUN and EXCITEMENT!

Wired & Tested
$139.95

$68.95 FM.10 KIT

FM 10 includes a two color, silk screened, aluminum chassis, the deluxe CYBERNET (Hy Gain) CB board. True FM discriminator kit, crystal, jacks, pots, hardware and a thorough instruction manual.

HAMFEST SPECIAL $33.00
Same as above, less chassis, hardware
DISCRIMINATOR/DEVIATION KIT $12.95
TEN METER FM HANDBOOK $4.95

HEIL SOUND, LTD.
Marissa, IL 62257
↙59
The One-Stop Parts House for 10 FM!

HAM PROGRAMS FOR THE VIC—20

RTTY8K $10.95
NEW LOWER PRICE! SAME GREAT FEATURES. ASCII, Baudot all common speeds. Automatic CQ and Start, End messages. Transmit/Receive control AND use with ANY terminal unit. 10 Message Buffers. Status Display, high-readability screen format. (When ordering, state callsign for programming into Automatic Messages)

WAS LOG or WAC LOG . . . . . either for $4.95
Log and Search by call, date, band. Generates Needed, Worked or QSLs Outstanding reports on screen or printer

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5-Band versions of above LOG programs. Same features

CONTEST LOGGER/DUPER $9.95
Eliminates dupes, simplifies contest paperwork. Produces printed contest report. Use for ANY contest

SWL LOG $4.95
Log and Search and obtain reports on printer or screen of Stations heard by Callsign, Frequency, Service, and Date

RTTY/SWL $6.95
Receive News, Weather, Commercial traffic on the HF bands. Features all common Baudot speeds, ASCII for the Ham bands, switchable Un-Shift On Space (USOS) and printer output

All programs supplied on cassette and require 8K expansion RAM

Send Check or Money Order To:
MICROFISH SOFTWARE PRODUCTS
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↙257

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$5.95 each, 3 for $17.00, 6 for $30.00
Binders: each binder holds 12 issues and opens flat for easy reading.
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&
ASSOCIATED EQUIPMENT

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LIBERTY ELECTRONICS, INC.

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- Don't let Morse code requirement keep you from upgrading!
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Please send _____ @ $19.00 each
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Name _____
Address _____
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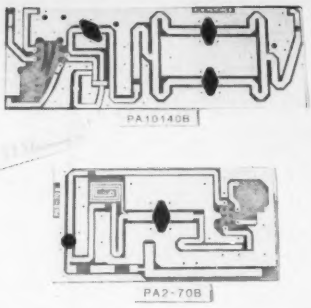
↙See List of Advertisers on page 114



EIMAC 4CX10,000D/8171 with SK300 and SK1306 . $1200.00

SK300 and SK1306 Only. $ 350.00

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Model PA2-70B RF power input 2watts at 144 to 148MHz output 70watts 13.5vdc at 10amps.
$49.99 with data PC Board Only $14.99

MODEL PA10140B RF power input 10watts at 144 to 148MHz output 140watts 13.5vdc at 18amps.
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GENEVA CALCULATOR WATCH

This attractive watch has the following modes:
Normal Time Setting,
Calendar Setting,
Daily Alarm Time Setting,
Weekly Alarm Time Setting,
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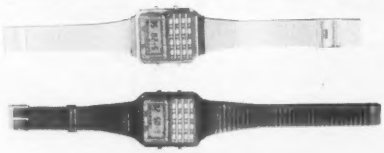

Featured in Black Plastic **$18.99** or Featured in Stainless Steel $29.99

SILICOM DIODES

MR751	100vdc	6Amps	10/$5.00	100/$38.00
MR510	1000vdc	3Amps	10/$3.75	100/$24.00
HEP170	1000vdc	2Amps	20/$2.00	100/$15.00
1N3209	100vdc	15Amps	$2.00	10/ $15.00
BYX21/200	200vdc	25Amps	$2.00	10/ $15.00
1N2138A	600vdc	60Amps	$5.00	10/ $40.00
DS85-04C	400vdc	80Amps	$10.00	10/ $80.00
1N3269	600vdc	160Amps	$15.00	10/$120.00
27SZ41	300vdc	250Amps	$20.00	10/$175.00
7-5754	300vdc	400Amps	$30.00	10/$250.00
RCD-15	15KVDC	20ma.	$3.00	10/ $20.00
SMFR20K	20KVDC	20ma.	$4.00	10/ $30.00
1N4148	signal		30/$1.00	100/ $3.00

FEED THRU SOLDER RF CAPACTORS

470pf +-20%	
	5/$1.00 or 100/$15.00 or 1000/$100.00
1000pf/.001uf +-10%	
	4/$1.00 or 100/$20.00 or 1000/$150.00

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2708 1024x1	$2.00 each
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27L32/25L32	$10.00 each

FAIRCHILD 4116 16K DYNAMIC RAMS 200ns. Part # 16K75

25 For $25.00 or 100 For $90.00 or 1000 For $750.00

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1N5711	(5082-2800)	Schottky Barrier Diodes	$1.00 or 10 for $ 8.50
1N5712	(5082-2810)	" " "	$1.50 or 10 for $10.00
1N6263	(HSCH-1001)	" " "	$ .75 or 10 for $ 5.00
5082-2835		" " "	$1.50 or 10 for $10.00
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"MIXERS"

WATKINS JOHNSON WJ-M6 Double Balanced Mixer

LO and RF 0.2 to 300MHz	IF DC to 300MHz	$21.00
Conversion Loss (SSB)	6.5dB Max. 1 to 50MHz 8.5dB Max. .2 to 300MHz	WITH DATA SHEET
Noise Figure (SSB)	same as above 8.5dB Max. 50 to 300MHz	
Conversion Compression	.3dB Typ.	

NEC (NIPPON ELECTRIC CO. LTD. NE57835/2SC2150 Microwave Transistor

NF Min F=2GHz dB 2.4 Typ. MAG F=2GHz dB 12 Typ. $5.30
F=3GHz dB 3.4 Typ. F=3GHz dB 9 Typ.
F=4GHz dB 4.3 Typ. F=4GHz dB 6.5 Typ.

Ft Gain Bandwidth Product at Vce=8v, Ic=10ma. GHz 4 Min. 6 Typ.
Vcbo 25v Vceo 11v Vebo 3v Ic 50ma. Pt. 250mw

UNELCO RF Power and Linear Amplifier Capacitors

These are the famous capacitors used by all the RF Power and Linear Amplifier manufacturers, and described in the RF Data Book.

5pf	10pf	18pf	30pf	43pf	100pf	200pf	1 to 10pcs. $1.00 ea
5.1pf	12pf	22pf	32pf	51pf	110pf	220pf	11 to 50pcs. $ .90 ea
6.8pf	13pf	25pf	33pf	60pf	120pf	470pf	51 up pcs. $ .80 ea
7pf	14pf	27pf	34pf	80pf	130pf	500pf	
8.2pf	15pf	27.5pf	40pf	82pf	140pf	1000pf	

NIPPON ELECTRIC COMPANY TUNNEL DIODES $7.50

		MODEL 1S2199	1S2200
Peak Pt. Current ma.	Ip	9min. 10Typ. 11max.	9min. 10Typ. 11max.
Valley Pt. Current ma.	Iv	1.2Typ. 1.5max.	1.2Typ. 1.5max.
Peak Pt. Voltage mv.	Vp	95Typ. 120max.	75Typ. 90max.
Projected Peak Pt. Voltage mv.	Vpp Vf=Ip	480min. 550Typ. 630max.	440min. 520Typ. 600max.
Series Res. Ohms	rS	2.5Typ. 4max.	2Typ. 3max.
Terminal Cap. pf.	Ct	1.7Typ. 2max.	5Typ. 8max.
Valley Pt. Voltage mv.	VV	370Typ.	350Typ.

FAIRCHILD / DUMONT Oscilloscope Probes Model 4290B

Input Impedance 10 meg., Input Capacity 6.5 to 12pf., Division Ratio (Volts/Div Factor) 10:1, Cable Length 4Ft. , Frequency Range Over 100MHz.
These Probes will work on all Tektronix, Hewlett Packard, and other Oscilloscopes.

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1S2200	7.50
2N1561	25.00
2N1562	25.00
2N2857	1.55
2N2857JAN	2.55
2N2876	11.00
2N2947	18.35
2N2948	15.50
2N2949	3.90
2N2950	4.60
2N3375	8.00
2N3553	1.57
2N3632	13.80
2N3818	5.00
2N3866	1.30
2N3924	3.35
2N3927	17.75
2N3950	25.00
2N4072	1.80
2N4127	21.00
2N4427	1.30
2N4428	1.85
2N4957	3.45
2N4958	2.90
2N4959	2.30
2N5090	13.90
2N5108	4.00
2N5109	1.70
2N5160	3.45
2N5177	21.62
2N5179	1.00
2N5583	4.00
2N5589	8.65
2N5590	10.35
2N5591	13.80
2N5635	10.95
2N5637	15.50
2N5641	9.20
2N5642	10.95
2N5643	15.50
2N5645	13.80
2N5646	20.70
2N5691	18.00
2N5764	27.00
2N5836	5.45
2N5842	8.00
2N5849	20.00
2N5913	3.25
2N5922	10.00
2N5923	25.00
2N5941	23.00
2N5942	40.00
2N5944	9.20
2N5945	11.50
2N5946	19.00
2N6080	9.20
2N6081	10.35
2N6082	11.50

PART	PRICE
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2N6084	15.00
2N6094 /M9622	11.00
2N6095 /M9623	12.00
2N6096 /M9624	15.50
2N6097	17.25
2N6136	21.85
2N6166	40.25
2N6201	50.00
2N6459	18.00
2N6603	12.00
2N6680	80.00
2SC756A	7.50
2SC781	2.80
2SC1018	1.00
2SC1042	12.00
2SC1070	2.50
2SC1239	2.50
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2SC1760	1.50
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BGY55	25.00
BGY74	25.00
BGY75	25.00
BL161	10.00
BLX67	11.00
BLY568CF	25.00
BLY87	13.00
BLY88	14.00
BLY89	15.00
BLY90	20.00
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35826E H.P.	POR
35831E H.P.	29.99
35853E H.P.	71.50
35854E H.P.	75.00
HPA0241 H.P.	75.60
HXTR3101 H.P.	7.00
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MA41765	POR
MA43589	POR
MA43636	POR
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MA47651	25.50

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GaAs, TUNNEL DIODES, ETC.

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MA47771	POR
MA47852	POR
MA49558	POR
MB4021	POR
MBD101	1.00
MDO513	POR
MHW1171	42.50
MHW1182	48.60
MHW4171	49.35
MHW4172	51.90
MHW4342	68.75
MLP102	25.00
MM1500	32.32
MM1550	POR
MM1552	50.00
MM1553	50.00
MM1614	10.00
MM2608	5.00
MM3375A	11.50
MM4429	10.00
MM8000	1.15
MM8006	2.30
MO277L	POR
MO283L	POR
MO3757	POR
MP102	POR
MPN3202	10.00
MPN3401	.52
MPN3412	1.00
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MRA2023-1.5 TRW	42.50
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MRF223	13.25
MRF224	15.50
MRF237	3.15
MRF238	12.65
MRF243	25.00
MRF245	34.50
MRF247	34.50
MRF304	43.45
MRF315	23.00
MRF420	20.00
MRF421	36.80
MRF422	41.40
MRF427	16.10
MRF428	46.00
MRF450/A	13.80
MRF453/A	17.25
MRF454/A	19.90
MRF455/A	16.00
MRF458	19.90
MRF463	25.00
MRF472	1.00
MRF475	2.90
MRF477	11.50
MRF502	1.04

PART	PRICE
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MRF504	7.00
MRF509	5.00
MRF511	8.65
MRF605	20.00
MRF629	3.47
MRF644	23.00
MRF816	15.00
MRF823	20.00
MRF901	3.00
MRF8004	2.10
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MT4150 Fair.	POR
MT5126 Fair.	POR
MT5481 Fair.	POR
MT5482 Fair.	POR
MT5483 Fair.	POR
MT5596 Fair.	POR
MT5764 Fair.	POR
MT8762 Fair.	POR
MV109	.77
MV1401	8.75
MV1624	1.42
MV1805	15.00
MV1808	10.00
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MV1864B	10.00
MV1864D	10.00
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MV2101	.90
MV2111	.90
MV2115	1.55
MV2201	.53
MV2203	.53
MV2209	2.00
MV2215	2.00
MWA110	7.45
MWA120	7.80
MWA130	8.25
MWA210	7.80
MWA220	8.25
MWA230	8.65
MWA310	8.25
MWA320	8.65
MWA330	9.50
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ON382	5.00
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PSCQ2-160	POR
PT3190	POR
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PT3195	POR
PT3537	POR
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PT4176D	POR

PART	PRICE
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PT4209	POR
PT4209C	POR
PT4566	POR
PT4570	POR
PT4571	POR
PT4571A	POR
PT4577	POR
PT4590	POR
PT4612	POR
PT4628	POR
PT4640	POR
PT4642	POR
PT5632	POR
PT5749	POR
PT6612	POR
PT6626	POR
PT6709	POR
PT6720	POR
PT8510	POR
PT8524	POR
PT8609	POR
PT8633	POR
PT8639	POR
PT8659	POR
PT8679	POR
PT8708	POR
PT8709	POR
PT8727	POR
PT8731	POR
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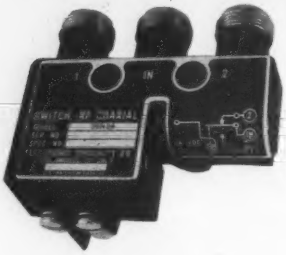
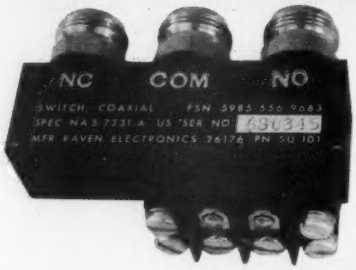
COAXIAL RELAY SWITCHES SPDT

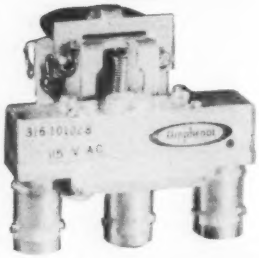
Electronic Specialty Co./Raven Electronics FSN 5985-556-9683 $49.00
Part # 25N28 Part # SU-01
26Vdc Type N Connector, DC to 1 GHz.





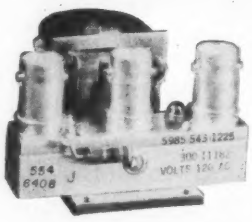
Amphenol
Part # 316-10102-8
115Vac Type BNC DC to 3 GHz.

$29.99



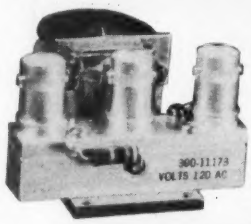
FXR
Part # 300-11182
120Vac Type BNC DC to 4 GHz.
FSN 5985-543-1225

$39.99



FXR
Part # 300-11173
120Vac Type BNC Same
FSN 5985-543-1850

$39.99



BNC To Banana Plug Coax Cable RG-58 36 inch or BNC to N Coax Cable RG-58 36 inch.

$7.99 or 2 For $13.99 or 10 For $50.00

$8.99 or 2 For $15.99 or 10 For $60.00

SOLID STATE RELAYS

P&B Model ECT1DB72 PRICE EACH $5.00	5vdc turn on	120vac contact at 7amps or 20amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
Digisig, Inc. Model ECS-215 PRICE EACH $7.50	5vdc turn on	240vac contact 14amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.
Grigsby/Barton Model GB7400 PRICE EACH $7.50	5vdc turn on	240vac contact at 15amps or 40amps on a 10"x 10"x .124 aluminum. Heatsink with silicon grease.

NOTE: *** Items may be substituted with other brands or equivalent model numbers. ***

For information call: (602) 242-3037

MHz electronics

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Toll Free Number
800-528-0180
(For orders only)

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

RECALL PHONE MEMORY TELEPHONE WITH 24 NUMBER AUTO DIALER

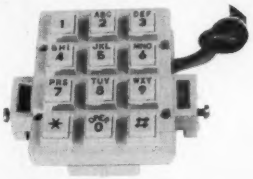
The Recall Phone Telephone employs the latest state of art communications technology.It is a combination telephone and automatic dialer that uses premium-quality,solid-state circuitry to assure high-reliability performance in personal or business applications. $49.99

ARON ALPHA RAPID BONDING GLUE

Super Glue #CE-486 high strength rapid bonding adhesive.Alpha Cyanoacrylate.Set-Time 20 to 40 sec.,0.7fl.oz.(20gm.) $2.00

TOUCH TONE PAD

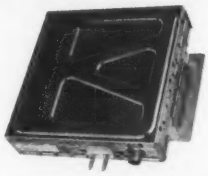
This pad contains all the electronics to produce standard touch-tone tones. New with data.



$9.99 or 10/$89.99

MITSUMI UHF/VHF VARACTOR TUNER MODEL UVE1A

Perfect for those unscrambler projects. New with data.



$19.99 or 10/$149.99

INTEGRATED CIRCUIT.		1 to 10	11up
MC1372P	Color TV Video Modulator Circuit.	$ 4.42	$2.95
MC1358P	IF Amp.,Limiter,FM Detector,Audio Driver,Electronic Attenuator.	5.00	4.00
MC1350P	IF Amplifier	1.50	1.25
MC1330A1P	Low Level Video Detector	1.50	1.15
MC1310P	FM Stereo Demodulator	4.29	3.30
MC1496P	Balanced Modulator/Demodulator	1.50	1.25
LM565N	Phase Locked Loop	2.50	2.00
LM380N14	2Watt Audio Power Amplifier	1.56	1.25
LM1889N	TV Video Modulator	5.00	4.00
NE564N	Phase Locked Loop	10.00	8.00
NE561N	Phase Locked Loop	10.00	8.00

FERRANTI ELECTRONICS AM RADIO RECEIVER MODEL ZN414 INTEGRATED CIRCUIT.
Features:
1.2 to 1.6 volt operating range.,Less than 0.5ma current consumption. 150KHz to 3MHz Frequency range.,Easy to assemble,no alignment necessary. Effective and variable AGC action., Will drive an earphone direct. Excellent audio quality.,Typical power gain of 72dB.,TO-18 package. With data. $2.99 or 10 For $24.99

NI CAD RECHARGEABLE BATTERIES

AA Battery Pack of 6 These are Factory New. $5.00

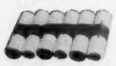
SUB C Pack of 10 2.5Amp/Hr. $10.00

Gates Rechargeable Battery Packs

12vdc at 2.5Amp/Hr. $11.99
12vdc at 5Amp/Hr. $15.99

MOTOROLA MRF559 RF TRANSISTOR
hfe 30min 90typ 200max.
ft 3000mhz
gain 8db min 9.5typ at 870mhz
13db typ at 512mhz
output power .5watts at 12.5vdc at 870mhz.

$2.05 or 10/$15.00



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"SOCKETS AND CHIMNEYS"

EIMAC TUBE SOCKETS AND CHIMNEYS

SK110	Socket	$POR
SK300A	Socket For 4CX5000A,R,J, 4CX10,000D, 4CX15,000A,J	$520.00
SK400	Socket For 4-125A,250A,400A,400C,4PR125A,400A,4-500A,5-500A	260.00
SK406	Chimney For 4-250A,400A,400C,4PR400A	74.00
SK416	Chimney For 3-400Z	36.00
SK500	Socket For 4-1000A/4PR1000A/B	390.00
SK600	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	51.00
SK602	Socket For 4CX250B,BC,FG,R,4CX350A,F,FJ	73.00
SK606	Chimney For 4CX250B,BC,FG,R,4CX350A,F,FJ	11.00
SK607	Socket For 4CX600J,JA	60.00
SK610	Socket For 4CX600J,JA	60.00
SK620	Socket For 4CX600J,JA	66.00
SK626	Chimney For 4CX600J,JA	10.00
SK630	Socket For 4CX600J,JA	66.00
SK636B	Chimney For 4CX600J,JA	34.00
SK640	Socket For 4CX600J,JA	36.00
SK646	Chimney For 4CX600J,JA	71.00
SK700	Socket For 4CX300A,Y,4CX125C,F	225.00
SK711A	Socket For 4CX300A,Y,4CX125C,F	225.00
SK740	Socket For 4CX300A,Y,4CX125C,F	86.00
SK770	Socket For 4CX300A,Y,4CX125C,F	86.00
SK800A	Socket For 4CX1000A,4CX1500B	225.00
SK806	Chimney For 4CX1000A,4CX1500B	40.00
SK810	Socket For 4CX1000A,4CX1500B	225.00
SK900	Socket For 4X500A	300.00
SK906	Chimney For 4X500A	57.00
SK1420	Socket For 5CX3000A	650.00
SK1490	Socket For 4CV8000A	585.00

JOHNSON TUBE SOCKETS AND CHIMNEYS

124-111/SK606	Chimney For 4CX250B,BC,FG,R, 4CX350A,F,FJ	$ 10.00
122-0275-001	Socket For 3-500Z, 4-125A, 250A, 400A, 4-500A, 5-500A	(pair)15.00
124-0113-00	Capacitor Ring	15.00
124-116/SK630A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
124-115-2/SK620A	Socket For 4CX250B,BC,FG,R, /4CX350A,F,FJ	55.00
	813 Tube Socket	20.00

TUBE CAPS (Plate)

HR1, 4	$11.00
HR2,3, 6 & 7	13.00
HR5, 8	14.00
HR9	17.00
HR10	20.00

CHIP CAPACITORS

.8pf	10pf	100pf*	430pf
1pf	12pf	110pf	470pf
1.1pf	15pf	120pf	510pf
1.4pf	18pf	130pf	560pf
1.5pf	20pf	150pf	620pf
1.8pf	22pf	160pf	680pf
2.2pf	24pf	180pf	820pf
2.7pf	27pf	200pf	1000pf/.001uf*
3.3pf	33pf	220pf*	1800pf/.0018uf
3.6pf	39pf	240pf	2700pf/.0027uf
3.9pf	47pf	270pf	10,000pf/.01uf
4.7pf	51pf	300pf	12,000pf/.012uf
5.6pf	56pf	330pf	15,000pf/.015uf
6.8pf	68pf	360pf	18,000pf/.018uf
8.2pf	82pf	390pf	

PRICES: 1 to 10 - .99¢ 101 to 1000 .60¢ * IS A SPECIAL PRICE: 10 for $7.50
11 to 50 - .90¢ 1001 & UP .35¢ 100 for $65.00
51 to 100 - .80¢ 1000 for $350.00

WATKINS JOHNSON WJ-V907: Voltage Controlled Microwave Oscillator $110.00

Frequency range 3.6 to 4.2GHz, Power ouput, Min. 10dBm typical, 8dBm Guaranteed. Spurious output suppression Harmonic (nf_0), min. 20dB typical, In-Band Non-Harmonic, min. 60dB typical, Residual FM, pk to pk, Max. 5KHz, pushing factor, Max. 8KHz/V, Pulling figure (1.5:1 VSWR), Max. 60MHz, Tuning voltage range +1 to +15volts, Tuning current, Max. -0.1mA, modulation sensitivity range, Max. 120 to 30MHz/V, Input capacitance, Max. 100pf, Oscillator Bias +15 +-0.05 volts @ 55mA, Max.

Toll Free Number
800-528-0180
(For orders only)

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PRICES SUBJECT TO CHANGE WITHOUT NOTICE

TUBES

TYPE	PRICE	TYPE	PRICE	TYPE	PRICE
2C39/7289	$ 34.00	1182/4600A	$500.00	ML7815AL	$ 60.00
2E26	7.95	4600A	500.00	7843	107.00
2K28	200.00	4624	310.00	7854	130.00
3-500Z	102.00	4657	84.00	ML7855KAL	125.00
3-1000Z/8164	400.00	4662	100.00	7984	14.95
3B28/866A	9.50	4665	500.00	8072	84.00
3CX400U7/8961	255.00	4687	P.O.R.	8106	5.00
3CX1000A7/8283	526.00	5675	42.00	8117A	225.00
3CX3000F1/8239	567.00	5721	250.00	8121	110.00
3CW30000H7	1700.00	5768	125.00	8122	110.00
3X2500A3	473.00	5819	119.00	8134	470.00
3X3000F1	567.00	5836	232.50	8156	12.00
4-65A/8165	69.00	5837	232.50	8233	60.00
4-125A/4D21	79.00	5861	140.00	8236	35.00
4-250A/5D22	98.00	5867A	185.00	8295/PL172	500.00
4-400A/8438	98.00	5868/AX9902	270.00	8458	35.00
4-400B/7527	110.00	5876/A	42.00	8462	130.00
4-400C/6775	110.00	5881/6L6	8.00	8505A	95.00
4-1000A/8166	444.00	5893	60.00	8533W	136.00
4CX250B/7203	54.00	5894/A	54.00	8560/A	75.00
4CX250FG/8621	75.00	5894B/8737	54.00	8560AS	100.00
4CX250K/8245	125.00	5946	395.00	8608	38.00
4CX250R/7580W	90.00	6083/AZ9909	95.00	8624	100.00
4CX300A/8167	170.00	6146/6146A	8.50	8637	70.00
4CX350A/8321	110.00	6146B/8298	10.50	8643	83.00
4CX350F/8322	115.00	6146W/7212	17.95	8647	168.00
4CX350FJ/8904	140.00	6156	110.00	8683	95.00
4CX600J/8809	835.00	6159	13.85	8877	465.00
4CX1000A/8168	242.50*	6159B	23.50	8908	13.00
4CX1000A/8168	485.00	6161	325.00	8950	13.00
4CX1500B/8660	555.00	6280	42.50	8930	137.00
4CX5000A/8170	1100.00	6291	180.00	6L6 Metal	25.00
4CX10000D/8171	1255.00	6293	24.00	6L6GC	5.03
4CX15000A/8281	1500.00	6326	P.O.R.	6CA7/EL34	5.38
4CW800F	710.00	6360/A	5.75	6CL6	3.50
4D32	240.00	6399	540.00	6DJ8	2.50
4E27A/5-125B	240.00	6550A	10.00	6DQ5	6.58
4PR60A	200.00	6883B/8032A/8552	10.00	6GF5	5.85
4PR60B	345.00	6897	160.00	6GJ5A	6.20
4PR65A/8187	175.00	6907	79.00	6GK6	6.00
4PR1000A/8189	590.00	6922/6DJ8	5.00	6HB5	6.00
4X150A/7034	60.00	6939	22.00	6HF5	8.73
4X150D/7609	95.00	7094	250.00	6JG6A	6.28
4X250B	45.00	7117	38.50	6JM6	6.00
4X250F	45.00	7203	P.O.R.	6JN6	6.00
4X500A	412.00	7211	100.00	6JS6C	7.25
5CX1500A	660.00	7213	300.00*	6KN6	5.05
KT88	27.50	7214	300.00*	6KD6	8.25
416B	45.00	7271	135.00	6LF6	7.00
416C	62.50	7289/2C39	34.00	6LQ6 G.E.	7.00
572B/T160L	49.95	7325	P.O.R.	6LQ6/6MJ6 Sylvania	9.00
592/3-200A3	211.00	7360	13.50	6ME6	8.90
807	8.50	7377	85.00	12AT7	3.50
811A	15.00	7408	2.50	12AX7	3.00
812A	29.00	7609	95.00	12BY7	5.00
813	50.00	7735	36.00	12JB6A	6.50

NOTE * = USED TUBE

NOTE P.O.R. = PRICE ON REQUEST

"ALL PARTS MAY BE NEW, USED, OR SURPLUS. PARTS MAY BE SUBSTITUTED WITH COMPARABLE PARTS IF WE ARE OUT OF STOCK OF AN ITEM.

NOTICE: ALL PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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(For orders only)

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"FILTERS"

COLLINS Mechanical Filter #526-9724-010 MODEL F455Z32F

455KHZ at 3.2KHz wide. May be other models but equivalent. May be used or new. $15.99

ATLAS Crystal Filters

5.595-2.7/8/LSB, 5.595-2.7/LSB
8 pole 2.7KHz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-2.7/8/U, 5.595-2.7/USB
8 pole 2.7Khz wide Upper sideband. Impedence 800ohms 15pf In/800ohms 0pf out. 19.99

5.595-.500/4, 5.595-.500/4/CW
4 pole 500 cycles wide CW. Impedance 800ohms 15pf In/800ohms 0pf out. 19.99

9.0USB/CW
6 pole 2.7KHz wide at 6dB. Impedance 680ohms 7pf In/300ohms 8pf out. CW-1599Hz 19.99

KOKUSAI ELECTRIC CO, Mechanical Filter #MF-455-ZL/ZU-21H

455KHz at Center Frequency of 453.5KC. Carrier Frequency of 455KHz 2.36KC Bandwidth.
Upper sideband. (ZU) 19.99
Lower sideband. (ZL) 19.99

****

CRYSTAL FILTERS

NIKKO	FX-07800C	7.8MHz	$10.00
TEW	FEC-103-2	10.6935MHz	10.00
SDK	SCH-113A	11.2735MHz	10.00
TAMA	TF-31H250	CF 3179.3KHz	19.99
TYCO/CD	001019880	10.7MHz 2pole 15KHz bandwidth	5.00
MOTOROLA	4884863B01	11.7MHz 2pole 15KHz bandwidth	5.00
PTI	5350C	12MHz 2pole 15KHz bandwidth	5.00
PTI	5426C	21.4MHz 2pole 15KHz bandwidth	5.00
PTI	1479	10.7MHz 8pole bandwidth 7.5KHz at 3dB, 5KHz at 6dB	20.00
COMTECH	A10300	45MHz 2pole 15KHz bandwidth	6.00
FRC	ERXF-15700	20.6MHz 36KHz wide	10.00
FILTECH	2131	CF 7.825MHz	10.00

****

CERAMIC FILTERS

AXEL	4F449	12.6KC Bandpass Filter 3dB bandwidth 1.6KHz from 11.8-13.4KHz	10.00
CLEVITE	TO-01A	455KHz+-2KHz bandwidth 4-7% at 3dB	5.00
	TCF4-12D36A	455KHz+-1KHz bandwidth 6dB min 12KHz, 60dB max 36KHz	10.00
MURATA	BFB455B	455KHz	2.50
	BFB455L	455KHz	3.50
	CFM455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 50dB	6.65
	CFM455D	455KHz +-7KHz at 3dB , +-10KHz at 6dB , +-20KHz at 50dB	6.65
	CFR455E	455KHz +-5.5KHz at 3dB , +-8KHz at 6dB , +-16KHz at 60dB	8.00
	CFU455B	455KHz +-2KHz bandwidth +-15KHz at 6dB, +-30KHz at 40dB	2.90
	CFU455C	455KHz +-2KHz bandwidth +-12.5KHz at 6dB , +-24KHz at 40dB	2.90
	CFU455G	455KHz +-1KHz bandwidth +-4.5KHz at 6dB , +-10KHz at 40dB	2.90
	CFU455H	455KHz +-1KHz bandwidth +-3KHz at 6dB , +-9KHz at 40dB	2.90
	CFU455I	455KHz +-1KHz bandwidth +-2KHz at 6dB , +-6KHz at 40dB	2.90
	CFW455D	455KHz +-10KHz at 6dB , +-20KHz at 40dB	2.90
	CFW455H	455KHz +-3KHz at 6dB , +-9KHz at 40dB	2.90
	SFB455D	455KHz	2.50
	SFD455D	455KHz +-2KHz , 3dB bandwidth 4.5KHz +-1KHz	5.00
	SFE10.7MA	10.7MHz 280KHz +-50KHz at 3dB , 650KHz at 20dB	2.50
	SFE10.7MS	10,7MHz 230KHz +-50KHz at 3dB , 570KHz at 20dB	2.50
	SFG10.7MA	10.7MHz	10.00
NIPPON	LF-B4/CFU455I	455KHz +-1KHz	2.90
	LF-B6/CFU455H	455KHz +-1KHz	2.90
	LF-B8	455KHz	2.90
	LF-C18	455KHz	10.00
TOKIN	CF455A/BFU455K	455KHz +-2KHz	5.00
MATSUSHIRA	EFC-L455K	455KHz	7.00

****

SPECTRA PHYSICS INC. Model 088 HeNe LASER TUBES

POWER OUTPUT 1.6MW. BEAM DIA. .75MM BEAM DIR. 2.7MR 8KV STARTING VOLTAGE DC
68K OHM 1WATT BALLAST 1000VDC +-100VDC At 3.7MA $59.99

ROTRON MUFFIN FANS Model MARK4/MU2A1

115 VAC 14WATTS 50/60CPS IMPEDENCE PROTECTED-F 88CFM at 50CPS $ 7.99
105CFM at 60CPS THESE ARE NEW

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HEWLETT PACKARD SIGNAL GENERATORS

606A	50KHz to 65MHz in 6 bands +-1%,Output level adjustable 0.1uV to 3V into 50 ohms.Built-in crystal calibrator.400 -1000Hz modulation.	$ 650.00
606B	Same as above but has frequency control feature to allow operation with HP 8708A Synchronizer.	$1100.00
608C	10MHz to 480MHz,0-1uV-1V into 50 ohms,AM,CW,or pulse modulation, calibrated attenuator.	$ 500.00
608D/ TS510	10MHz to 420MHz, 0.1uV-0.5V into 50 ohms,+-0.5% accuracy, built-in crystal calibrator, AM-CW or pulse output.	$ 375.00
608E	Improved version of popular 608C.Up to 1V output.Improved stability,low residual FM.	$1450.00
608F	10MHz to 455MHz in 5 bands +-1% frequency accuracy with built-in crystal calibrator.Can be used with HP 8708A Synchronizer. Output continuously adjustable from .1uV to .5V into 50 ohms.	$1100.00
612A	450-1230MHz ,0.1uV-0.5V into 50 ohms,calibrated output.	$ 750.00
614A	900-2100MHz with many features including calibrated output and all modulation characteristics.	$ 500.00
616A/ TS403	Direct reading and direct control from 1.8 to 4.2GHz. The H.P.616A features +-1.5dB calibrated output accuracy from -3127dBm to -dBm.The output is directly calibrated in microvolts and dBm with continuous monitoring. Simple operation, frequency dial accuracy is +-1% and stability exceeds 0.005%-/ C change in ambient temperature. Calibrated attenuator is within +-1.5dB over entire output band. 50 ohm impedance unit has internal pulse modulation with rep rate variable from 40 Hz to 4KHz,variable pulsewidth(1 to 10usec)and variable pulse delay(3 to 300usec).External modulating inputs increas versatility.	$ 375.00
616B	Same as above but later model.	$ 600.00
618B	3.8 to 7.6GHz range,with calibrated output and selection of pulse-FM or square wave modulation.	$ 600.00
618C	Same as above but later model.	$2200.00
620A	7 to 11GHz range,with calibrated output and selection of pulse-FM or square wave modulation.	$ 750.00
620B	Same as above but later model.	$2200.00
626A	10 to 15GHz,10mw output power with calibrated output and pulse-square wave or FM modulation.	$4200.00
8708A	Synchronizer used with 606B,608F.The synchronizer is a phase-lock frequency stabilizer which provides crystal-oscillator frequency stability to 430MHz in the 608F signal generator.Phase locking eliminates microphonics and drift resulting in excellent frequency stability.The 8708A includes a vernier which can tune the reference oscillator over a range of +-0.25% permitting frequency settability to 2 parts in 10 to the seventh.Provides a very stable signal that satisfies many critical applications. (With HP 606B or 608F) (Without)	$ 350.00 $ 450.00
EMC-10	ELECTROMETRICS EMC-10 RFI/EMI RECEIVER Low frequency analyzer covering 20Hz to 50KHz frequency range.Extendable to 500 KHz in wideband mode.	$2500.00
NF-105F	Empire Devices Field Intensity Meter. Has NF-105/TA,NF-105/TX,NF-105/T1,NF-105/T2,NF-105/T3. Covers 14KHz to 1000MHz.	$2100.00

ALL EQUIPMENT CARRY A 30 DAY GUARANTEE.

EQUIPMENT IS NOT CALIBRATED.

UNEX LABORATORIES THS-2 FLEXICOM HEADSET.

these headsets come with data to hook up to a ICOM radios and many other equipment.

Perfect for Airplanes , Helicopters , Mobile Radios , or Just the Telephone.

These Are Factory New In Sealed Boxes. Limited Supply Only $69.95

ORDERING INSTRUCTIONS

DEFECTIVE MATERIAL: All claims for defective material must be made within sixty (60) days after receipt of parcel. All claims must include the defective material (for testing purposes), our invoice number, and the date of purchase. All returns must be packed properly or it will void all warranties.

DELIVERY: Orders are normally shipped within 48 hours after receipt of customer's order. If a part has to be backordered the customer is notified. Our normal shipping method is via First Class Mail or UPS depending on size and weight of the package. On test equipment it is by Air only. FOB shipping point.

FOREIGN ORDERS: All foreign orders must be prepaid with cashier's check or money order made out in U.S. Funds. We are sorry but C.O.D. is not available to foreign countries and Letters of Credit are not an acceptable form of payment either. Further information is available on request.

HOURS: Monday thru Saturday: 8:30 a.m. to 5:00 p.m.

INSURANCE: Please include 25¢ for each additional $100.00 over $100.00, United Parcel only.

ORDER FORMS: New order forms are included with each order for your convenience. Additional forms are available on request.

POSTAGE: Minimum shipping and handling in the US, Canada, and Mexico is $2.50 all other countries is $5.00. On foreign orders include 20% shipping and handling.

PREPAID ORDERS: Order must be accompanied by a check.

PRICES: Prices are subject to change without notice.

RESTOCK CHARGE: If parts are returned to MHZ Electronics due to customer error, customer will be held responsible for all extra fees, will be charged a 15% restocking fee, with the remainder in credit only. All returns must have approval.

SALES TAX: Arizona must add 5% sales tax, unless a signed Arizona resale tax card is currently on file with MHZ Electronics. All orders placed by persons outside of Arizona, but delivered to persons in Arizona are subject to the 5% sales tax.

SHORTAGE OR DAMAGE: All claims for shortages or damages must be made within 5 days after receipt of parcel. Claims must include our invoice number and the date of purchase. Customers which do not notify us within this time period will be held responsible for the entire order as we will consider the order complete.

OUR 800 NUMBER IS STRICTLY FOR ORDERS ONLY
NO INFORMATION WILL BE GIVEN. 1-800-528-0180.

TERMS: DOMESTIC: Prepaid, C.O.D. or Credit Card
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73 INTERNATIONAL

from page 76

ing. Be certain that your car is in top-notch condition, especially the brakes, and that you have a quality spare tire. Even though the NAF (Norwegian Automobile Forrening) has its emergency patrols on all major roads, offering a high degree of technical assistance, it could save you a good deal of trouble and money. Check your insurance policy so that it will cover expenses if you should be unlucky enough to have an accident. Norwegians are very helpful, and most of them speak or understand English, German, and maybe one or two other languages.

The reason for mentioning these things is, of course, that they are so very easy to forget. Remember that some of the roads you will be driving on will be quite steep and narrow, and in places the road is cut straight into the mountainside, leaving the driver and passengers with a splendid view of the abrupt mountainside both below and above. It's amazing where you will find farms and houses. You will wonder, as we do, how they get there!

Now, what about mobile radio in Norway? After the description of what kind of landscape will greet you, you will also understand the lack of sufficient repeaters on 2 meters and 70 cm. However, those repeaters we do have cover quite a long range, some as far as 100 to 250 km because they are placed on mountaintops at altitudes up to 1 or 2 km. Repeaters are mostly concentrated around the densely populated areas and cover the main highways, so if you are planning to visit the western or northern part, bring your HF rig with you. It could be of great value and a good companion.

Standard voltage in Norway is 220 V ac, 50 Hz. The 2-meter band goes from 144.000 to 146.000 MHz. Repeater frequencies are from 145.600 to 145.825, with receive −600 kHz, and they use 1750-Hz tone-burst access. The callsign is sent in CW, and a complete repeater list and frequency list will be given to you when your license is issued.

I really hope that this information is of assistance to you, and on behalf of all Norwegian amateurs, I wish you a hearty welcome to Norway; we really hope you will enjoy your stay here. Have a good vacation.

PAPUA NEW GUINEA

Siegi Freymadl P29NSF
PO Box 165
Rabaul, Papua New Guinea

Rabaul is one of the most strikingly situated towns in the world. It has been built inside a still-active volcano. The magnificent harbor, Rabaul's reason for existence, resulted from successive large eruptions and the eventual collapse of large volcanoes which were formerly located there. The hole remaining after this event, 12 by 8 kilometers across and up to 600 meters deep, contains the harbor and the main part of the town. It is in fact a volcanic caldera. Because of that, it is a potential site for future eruptions and a center of seismic activity.

Because of the publicity given in recent months to the possible destruction of Rabaul by a volcanic event, I have decided to devote this month's column to emergency services agencies in the area.

1) The National Emergency Services were formerly under the control of the Post and Telegraph Department, but approximately two years ago it was put under Defense Force control. One officer is looking after the headquarters at Rabaul, situated in a picturesque location on top of Namanula Hill, overlooking Rabaul. An emergency net between NES Rabaul and 29 stations throughout the New Guinea Islands is operated on a twice-daily fixed schedule at 0715 and 1915 local time on 3732 MHz. One of the stations checking into the net is P22DQ, the base station at the Volcanological Observatory Rabaul. Equipment used are Codan 7515 SSB sets, and the antenna at NES Headquarters in Rabaul is a dipole. Rabaul keeps a continuous watch from 0700 until the end of the last radio schedule at 1915. In case of an emergency, the officer is on 24-hour standby. He also provides a phone patch when needed. Operations Center is Defense Force Headquarters in Port Moresby; other NES bases are at Lae, Madang, Wewak, and Manus. The Rabaul officer was trained as communications officer by the Defense Force. He hopes for bigger communications sets with more crystals and better antennas in the near future. It is also to be hoped that the lone officer maintaining vigil at NES Rabaul will receive additional staff to assist him.

2) Since independence, the national government has instituted a decentralization program to hand over more and more authority to the various provinces. One of the newly created departments is the Disaster Planning Unit under the East New Britain Provincial Government, which has been in existence for just over three months. A coordinator is at the head of the department and plans are still being drawn up to cover volcanic emergencies and tsunamis, earthquakes, erosion, floods, and drought. For communications, Philips 2m SSB sets are in use at the office and in cars. At this stage, the Disaster Planning Unit is still "finding its feet."

3) The Central Observatory in Rabaul is situated up on North Daughter, a dormant volcano, and there all the sophisticated monitoring devices for seismic and volcanic activities are housed. Also operated from there is the volcanological net on 6815 MHz at 0800 and 1400 local time, seven days a week. Stations at Manam, Karkar, Langila, Talasea, Ulamona, and Esala are on the network using SSB voice and P22 prefixes. An additional callsign, P22CF, is assigned for mobile use. NES has access to this net and the Central Observatory in turn has access to the NES frequency. Rabaul Central Observatory, Karkar, Manam, and Esala use 100-W Codan sets with cut dipole antennas. The rest are equipped with 25-W portable Codan sets using longwire antennas. All stations, except Central Observatory Rabaul, are powered by batteries, which are charged by one 12-V, 2.4-Amp Arco solar panel. A portable seismograph is also powered by solar energy. Installed at the residence of the senior volcanologist is a Kenwood 930S and a dipole antenna, and he uses this set to conduct the volcanological net on weekends. A four-stage emergency plan has been drawn up, the last stage being implemented when an event is imminent within a few days or as little as a few hours.

These are the agencies in Rabaul looking after emergencies. Strangely enough, no effort has been made to enlist the help of any radio amateurs in the area. It seems to me that amateurs could render valuable services in times of emergency. This was pointed out to the Coordinator of the Disaster Planning Unit and the Officer-in-Charge at National Emergency Services, Rabaul.

PHILIPPINES

Leo M. Almazan
PSC #1, Box 1471
APO San Francisco CA 96286

The amateur-radio scene in the Philippines is about the same as in any of the Third-World countries around the world. The growth is in the upswing because of the availability of VHF/FM hand-helds, so there are more VHFers than HFers. The hobby is now under scrutiny because of illegal users of 2m FM rigs.

The regulatory body in the Republic of the Philippines is the NTC (National Telecommunication Commission) under the Ministry of Transportation and Communication. At present, the amateur license structures are as follows: Class A—full privilege, 2000 Watts PEP; Class B—same privilege as Class A except 20-meter phone privilege (14.275 and up only), 1000 Watts PEP only; Class C—Novice class, phone privilege on 40 meters and 2 meters only, CW also both bands, 25 Watts only PEP.

The Philippine amateur scene covers most aspects of the hobby. There are DXers, RTTY and OSCAR enthusiasts, VHF/UHF aficionados, and of course good "old-fashioned" CW buffs. Last April, Manila Hamfest '83 was one of the highlights of amateur radio in the country. It was sponsored by the Ham Radio Philippines Ham Club. This active organization put on a tremendous show by inviting all or most of the different clubs and organizations in the Philippines. A plenary session was held to map out the future of amateur radio in the Philippines.

For prospective visitors to the country, a reciprocal license is easily obtainable, provided the visitor's country of origin has a reciprocal agreement with the Republic of the Philippines. All you need is a photocopy of your license, three passport-size pictures, and the necessary paperwork. Processing is from one to two days. Most American "recips" (most of them are stationed either at Clark Air Base or Subic Naval Base) can have their reciprocal license mailed to their local or APO/FPO address. In my case, it was mailed to both!

More information can be acquired through the Philippine Amateur Radio Association, PO Box 4083, 17th Floor, Philippine Communication Center Building, Ortigas Avenue, Pasig Metro-Manila, Philippines. Or if you are an American serviceman, contact the Central Luzon Amateur Radio Club (CLARC) located at the old Carmelite Hospital, Angeles City, just outside Clark Air Base, or call telephone number 55228 inside Clark and ask for Jerry McCracken or Leo Almazan for more information.

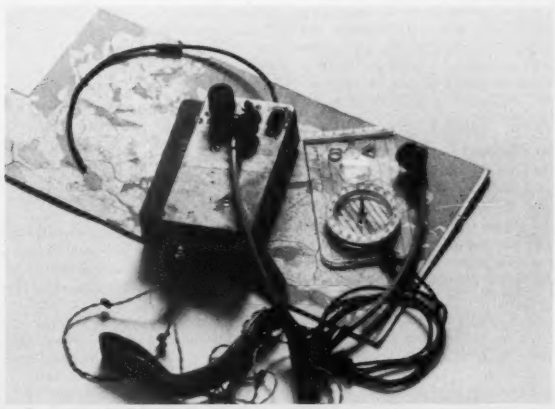
SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn, Sweden

The Swedish television devoted a full hour program to ham radio a few months ago. Mr. Erik Bergsten SM6DGR has for many years produced a very popular program called "Technical Magazine." A recent series of programs has been about the development of radio and television from the very beginning up to today's satellite TV. Amateur radio got its full share of this. Erik brought up specialized communications modes like moonbounce (EME), meteor-scatter, SSTV, RTTY, contesting, etc., and also amateur-radio direction-finding (ARDF), popularly called fox-hunting.

Fox-hunting, European style, brings the ham operator out from the shack into the fresh air. Radio direction-finding as a sport among hams started in Sweden in 1947 and spread quickly within Europe in the 50s. The first Swedish Championships were held in 1952 by Vasteras Radio Club, SK5AA, a club celebrating its 40th anniversary this year.

Swedish hams SM5IQ, SM5AVC, and



The fox-hunter's weapon—receiver and compass. Photo by SM0EJY.

SM5CRD went on their first "missionary" trip to Norway in 1952 to spread the idea of fox-hunting. The first unofficial European Championships were held in Sarajevo, Yugoslavia, in 1958 and this sport has become very popular in East Europe. The World Championships are usually arranged by an East European country.

US Variety

In the US, direction-finding on two-meter FM has a growing popularity. For this, two-meter hand-held equipment with HB9CV antennas is used. I saw this demonstrated at a Minuteman Repeater Association meeting in Boston, Massachusetts, about a year ago. In the US, fox-hunting is of course (!) done by automobile.

Orienteering

ARDF is very similar to the so-called orienteering, which is a sport in which you run in the forest trying to find checkpoints that are marked on a very detailed map. You also have a compass to help you. This Swedish sport is spreading all over the world. The New England Orienteering Club in Massachusetts has been very successful in the US. In fox-hunting, the checkpoints are well hidden and you have to try to find them (usually five) by the means of a map, a compass, and a small direction-finding receiver about the size of a king-size cigarette pack. Frequencies used are between 3,500 and 3,600 kHz. The transmitters used are low powered, just 2 Watts or less, and the antenna is a short vertical wire hung up in a tree. Each fox transmits a series of dashes — — — — — i.e., M O; the longer the dashes, the easier it is to determine direction. The five foxes transmit two minutes each, one at a time. No. 1 fox starts by sending a series of M O E M O E for two minutes. The letter E, i.e., one dit, identifies the first fox. No. 2 fox follows by sending M O I M O I, etc. After ten minutes, you have one bearing to each transmitter. You then quickly (by running) change position and take the cross-bearing during the next ten minutes. It is not as easy as it may sound.

No Code Proficiency Needed

You do not have to be a ham to participate in fox-hunting and knowledge of Morse code is of course not necessary. You can identify the fox by the number of dits transmitted.

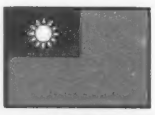
The development of automatic fox transmitters has facilitated the arrangements for a hunt. The old system required a minimum of five operators hiding in the woods and getting eaten up by the mosquitoes. These new automatic transmitters also give the successful hunter a slip on which the ID of the fox and the check-in time is printed. The hunter having proof of finding all five foxes in the shortest period of time is the winner. It sure is not always the fastest runner that wins. You must be accurate when you take the bearings.

Championships

In the Swedish as well as the Nordic, European, and World Championships in ARDF, the score is a combination of the results from both the day and the night hunt. The Swedish Championships this year took place in Eskilstuna, 90 kilometers west of Stockholm, in August.

The World Championships 1982 were going to be held in Bulgaria (LZ), but were postponed due to difficulties caused by the hosting country. The International Amateur Radio Union (IARU) Region 1 has developed international rules for amateur-radio direction-finding. ARDF is a very nice club activity, involving building and constructing the equipment and arranging the outdoor activities. Why don't you start this in your club? For further information, feel free to write to me (SASE or SAE + IRC, please). It is just a matter of getting started.

Claes SM0CTU taking bearings. Photo by SM0EJY.



TAIWAN

Tim Chen BV2A/BV2B
PO Box 30-547
Taipei, Taiwan 107
Republic of China

I feel quite honored to have had many visitors this year. A common question often raised by visitors is "Why is there only one station—BV2A/BV2B—on Taiwan?"

For security reasons, ham activity has been restricted to a certain extent in the past. However, I feel the situation has gradually improved, and the future looks bright.

Amateur-radio operation is governed by the so-called "Special Telecommunications Regulations," which was revised on October 9, 1972. The regulations stipulate that a Chinese national must pass an MOC (Ministry of Communications) examination or possess a professional radio license to receive a ham ticket. Hams were at first allowed to operate only on 14 and 28 MHz, but since December, 1981, the 21-MHz band has been open. At present, there are still three operative bands available; other HF and VHF bands for hams are not likely to be opened in the near future. I found that some bootleggers had deliberately used my calls on 40 and 80 meters and had caused a lot of confusion.

The examination consists of a test on fundamental electricity, radio principles, telecommunications regulations, and international radio regulations relevant to amateur-radio operation. A 13-wpm code-proficiency test is also required.

Obviously, the ruling is too simple to meet with the fast development of amateur-radio activities worldwide. I am given to understand that revision of the regulations is under way.

BV2A was first established in 1959 to operate on 20-meter CW only. In 1974, the ex-INDXA (International DX Association) of Maryland offered me a Heathkit 32A monoband transceiver to initiate 20-meter SSB operation with the callsign of BV2B. Later, W9ZNY lent me a hand and airshipped a set of 203BA antennas from Chicago, which, in conjunction with the HW32A, has greatly improved my signal. I would like to thank those contributors for their assistance.

Although there is only one ham station on this island, I am sure that a great many young men like the unique hobby and they will come into hamland as soon as the restriction is lifted.

Many times, Chinese authorities have rejected requests for visitors' licenses, since we have no reciprocal agreements with any other countries. Recently, a group of Italian hams—I2DMK, I2BVS, I2PKF, and I2JQ of the Associazone Radiotecnica Italiana—applied for permission to operate their rigs for ten days in commemoration of World Telecommunications Year. This request is now under favorable consideration by Chinese authorities. If the official approval can be obtained, it not only will enhance closer friendship between hams of the world, but also will create a good beginning for radio amateurs on this island.

VENEZUELA

Luis E. Suarez OA4KO/YV5
Apartado 66994
Caracas 1061-A
Venezuela

I sent an article on parabolic antennas to *73* as a contribution to help fellow amateurs in understanding the techniques that we'll be using during this new wave of radio communications. I'm convinced that with the advent of OSCAR 10 and other satellites that will follow, the use of frequencies above 2 meters along with new modes of operation will pervade the radio-amateur interest in the near future. Certainly parabolics at lower prices and of better materials will be bargains very soon. Just wait for the Direct-Broadcast Satellites which are practically standing in the launch pad. Anyhow, be prepared to handle at least a three-meter-diameter parabolic. In comparison with the most commonly used of today's HF antennas, the one-meter parabolic will be like a dipole and the three-meter parabolic will be like a three-element triband beam, so to speak. The worst thing is that the parabolic should be rotatable both in azimuth and elevation unless geostationary satellites were placed in orbit. For those liking fancy rigs and Molniya-orbit satellites, the bigger parabolics would be installed along with big rotators.

For us in Venezuela, having a parabolic on your own roof was prohibited because the communications authorities found out that some people were doing business with TVRO and video recorders. Anyway, since the present Minister of Communications (Francisco Lara YV5CBB) intends to perfect the present regulations, no doubt something will be done regarding this topic.

While writing on these matters, I tried to imagine how those great daring men in the world's history managed to explore, conquer, survive, or fight against men and nature to get freedom and liberty. I'm talking about David Crockett, Colon, Napoleon, Bolivar, etc. Can you imagine those men who, without electronic aids, went across the world in search of their dreams and fates?

A Venezuelan, Simon Bolivar, did it to liberalize Bolivia, Colombia, Ecuador, Panama, Peru, and Venezuela. For us Americans, it is easy to imagine how it was done, but let me tell you that South America is several times the size of Europe and that the Andes Mountains' altitudes are 5000 meters in Venezuela and up to 7000 meters in Bolivia. Can you imagine those resolute men crossing the Andes on foot, with horses and mules carrying weapons and food? Really not an easy task, and they did it not just once, but many times.

The Venezuelan territory offers infinite varieties in landscapes and in climate. All along her shores there are kilometers upon endless kilometers of sandy beaches. Temperature is high on the coast and on the plain. Being a Caribbean country, it is

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Switches

Mini toggle SPDT **$1.00**
Red Pushbuttons N.O. **3/$1.00**

Earphones

3" leads. 8 ohm. good for small tone speakers, alarm clocks, etc. 5 for $1.00

Mini 8 ohm Speaker

Approx. 2¼" diam. Round type for radios, mike etc. **3 for $2.00**

Solid State Buzzers

small buzzer. 450 Hz. 86 dB sound output on 5-12 vdc at 10-30 mA. TTL compatible **$1.50**

Slug Tuned Coils

Small 3/16" Hex Slugs turned coil. 3 turns. 10 for $1.00

AC Outlet

Panel Mount with Leads **4/$1.00**

CAPACITORS

TANTALUM Dipped Epoxy		ALUMINUM Electrolytic		DISK CERAMIC	
1.5 uF 25V	3/$1.00	1000 uF 16V Radial	$.50	01 16V disk	20/$1.00
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.22 uF 25V	3/$1.00	150 uF 16V Axial	5/$1.00	001 16V	20/$1.00
		10 uF 15V Radial	10/$1.00	100 pF	20/$1.00
				047 16V	20/$1.00

DC-DC Converter

+5 vdc input prod. -9 vdc @ 30ma
+9 vdc produces -15 vdc @ 35ma **$1.25**

Ceramic IF Filters

Mini-can 7 kHz B.W. SOLD OUT $1.50 ea.

25K 20 Turn Trim Pot **$1.00**

1K 20 Turn Trim Pot **$.50**

Trimmer Caps

Sprague - 3-40 pf Stable Polypropylene **.50 ea.**

Crystal Microphone

Small 1" diameter ¼" thick crystal mike cartridge **$.75**

Mini RG-174 Coax

10 ft. for $1.00

Coax Connector

Chassis mount BNC type **$1.00**

9 Volt Battery Clips

Nice quality clips **5 for $1.00**
¾" Rubber Grommets **10 for $1.00**

Parts Bag

Asst. of chokes, disc caps, tant. resistors, transistors, diodes, MICA caps etc. sm. bag (100 pc) **$1.00** lg. bag (300 pc) **$2.50**

Connectors

6 pin type gold contacts for mA-1003 car clock module price **.75 ea.**

Leds

- your choice, please specify
Mini Red, Jumbo Red, High Intensity Red, Illuminator Red **8/$1**
Mini Yellow, Jumbo Yellow, Jumbo Green **6/$1**

Varactors

Motorola MV 2209 30 PF Nominal cap 20-80 PF - Tunable range - **.50 each or 3/$1.00**

Audio Prescaler

Make high resolution audio measurements, great for musical instrument tuning, PL tones, etc. Multiplies audio UP in frequency, selectable x10 or x100, gives .01 HZ resolution with 1 sec. gate time! High sensitivity of 25 mv, 1 meg input z and built-in filtering gives great performance. Runs on 9V battery, all CMOS.

PS-2 kit **$29.95**
PS-2 wired **$39.95**

600 MHz PRESCALER

Extend the range of your counter to 600 MHz. Works with all counters. Less than 150 mv sensitivity. specify -10 or -100

Wired, tested, PS-1B **$59.95**
Kit, PS-1B **$44.95**

30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 30 W pwr amp kit **$22.95**
TR-1, RF sensed T-R relay kit **6.95**

AC Adapters

Good for clocks, nicad chargers, all 110 VAC plug one end.

8.5 vdc @ 20 mA	$1.00
16 vac @ 160mA	$2.50
12 vac @ 250mA	$3.00

MRF-238 transistor as used in PA-1 8-10db gain 150 mhz **$11.95**

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BI-FET LF 13741 - Direct pin for pin 741 co... but 500,000 MEG input z, super low 50 pa input curre... power drain.
50 for only $9.00 SOLD OUT **10 for $2.00**

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78MG	$1.25	7812	$1.00
79MG	$1.25	7815	$1.00
723	$.50	7905	$1.25
309K	$1.15	7912	$1.25
7805	$1.00	7915	$1.25

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Nice precut pces of shrink size 1" x ¼" shrink to ⅛". Great for splices **50/$1.00**

Mini TO-92 Heat Sinks

Thermalloy Brand **5 for $1.00**
To-220 Heat Sinks **3 for $1.00**

Opto Isolators - 4N28 type **$.50 ea.**

Opto Reflectors - Photo diode + LED **$1.00 ea.**

Molex Pins

Molex already precut in length of 7. Perfect for 14 pin sockets. **20 strips for $1.00**

CDS Photocells

Resistance varies with light, 250 ohms to over 3 meg **3 for $1.00**

See List of Advertisers on page 114

easy to imagine how high the temperature is. Nevertheless, due to trade winds, the weather is not too rigorous in the northeast. The northwest is far warmer, and you may expect temperatures as high as 41 degrees centigrade at sea level and on the plains.

Toward the west and northwest, the Andes Mountains with the treeless plateaus lead you from the warmth of the coast to the coldness of the altitudes. The highest mountain in Venezuela is Pico Bolivar (Bolivar Peak) in Merida State with an altitude of 5007 meters (16,000 feet). About 36,000 square kilometers of the territory are crossed by the Andes. That's why there are so many VHF repeaters in this country. More than 60 have been licensed on 2 meters and 70 cm covering half the nation.

Toward the south is the Orinoco River with a host of wide and lazy tributaries. They snake through the ever-green, dense, warm jungle. The river is 2,140 kilometers long with a maximum width of 20 kilometers near Ciudad Bolivar, capital city of Bolivar State. The river depth varies from 80 meters to 100 meters during the rainy season from July to November. One of the most important branches of the Orinoco is the Caroni river in Bolivar (YV6). On a tributary of this river, the Churun, is the highest waterfall in the world, the Salto Angel (Angel Fall). Plunging 1500 meters, this fall was discovered in 1937 by an American pilot named James C. Angel. In my opinion, it is located in the most beautiful landscape in South America—which also is one of the oldest in the world (Precambrian—600 million years ago).

The territory south of the Orinoco is sparsely populated, with some small towns, several thousand aborigines, and only two cities with more than 150,000 inhabitants: San Felix and Ciudad Bolivar. That's why there are only three repeaters in the southern territory.

Some advice is in order: Do not expect to meet feathered indians or loincloth-wearing people when you arrive in this country. If you like to see indians, be prepared for a long trip toward the south. This country has the typical occidental style both in look and way of life. Caracas, the capital city, is a modern metropolis and one of the most beautiful places in South America. I will try to depict in future columns how the country is, by call areas.

REPEATERS

A list of the already-working VHF repeaters is shown in the box. With all those repeaters and links, you may travel across the country by car, rag-chewing hour after hour using HTs.

The topography surrounding Caracas is mountainous with altitudes as high as 2,300 meters. Near here is where the Andes end, after a long line of mountains that begin in the southernmost part of South America. The highest repeater sites in the Caribbean are, no doubt, in Venezuela. There are two such repeaters channeled at 147.000 (−600) and 147.180 (−600) MHz bringing DX possibilities from time to time. Today (June 24) I heard WD4EXH/KP2 (Mike) from Saint Thomas and HI8AEA from the Dominican Republic. Not very often, but yet not uncommon, it is possible to hear Curacao, Aruba, Puerto Rico, Colombia, Dominican Republic, Panama, etc., due to anomalous propagation—you know, ducting and similar things. Fortunately, the abnormal propagation sometimes lasts several days. Some very slow fading is expected, so should the signal be lost, just wait a while and try again after some minutes. I have heard also that somebody made contact through the 147.000-MHz repeater with a mobile traveling from Tulsa, Oklahoma, to Orlando, Florida. This kind of DX through 2-meter repeaters is not new. During 1976, I made contact with Juan PJ3JAV and I remember his signal was solid for several days. So, Caribbean DXers, aim your 2m antennas to Caracas and push the mike button, and if you hear the kerchunk, give us a call.

VHF REPEATERS IN VENEZUELA

147.240	Barcelona	146.700	Maracaibo
146.910	Barcelona	146.850	Maracaibo
146.610	Barquisimeto	147.030	Maracaibo
146.970	Barquisimeto	147.060	Maracaibo
146.700	Barinas	147.180	Maracaibo
146.940	Bocono	146.850	Maracaibo
146.820	Caracas	146.700	Maracay
146.730	Caracas	146.880	Margarita
147.000	Caracas	147.300	Maturin
147.180	Caracas	146.010	Maturin
146.790	Carupano	146.610	Merida
146.700	Ciudad Bolivar	146.820	Merida
146.760	Ciudad Ojeda	146.940	Merida
145.925	Ciudad Ojeda	147.270	Merida
146.790	Coro	147.120	Metropolitan Airport
147.090	Coro	146.760	Platillon
147.190	Coro	146.940	Puerto Ordaz
146.700	Cumana	146.610	San Cristobal
146.610	Eastern	146.730	San Cristobal
146.880	El Guri	146.740	San Cristobal
146.970	El Hatillo	146.880	San Cristobal
147.180	El Junquito	146.940	San Cristobal
147.790	El Tigre	147.730	San Cristobal
147.390	El Vigia	146.760	Upata
146.940	La Guaira	146.820	Valencia
145.340	La Victoria	146.850	Valancia
147.210	La Victoria	146.940	Valancia
146.970	Machiques	147.840	Valancia
146.640	Maracaibo	147.970	Western

I have investigated the ham population and it seems to be 20,500 strong instead of 16,000 as I wrote previously. Up to this moment, 30,664 ham licenses have been issued. Thus, more than 10,600 were cancelled or lost due to several causes, including silent keys. There are around 3,000 active hams using all bands from 160 to 23 cm and all modes including SSB, RTTY, SSTV, etc. There also is some activity with current satellites although just a handful of Venezuelan hams are registered AMSAT members. They are Manuel YV5LW, Jose YV4CB, Wolfram YV4WT, Asvaldo YV6ASU, Jorge YV5FNG, Hector YV5BQO, Jose YV5GDX, Efrain YV4CLV, Edgar YV5ZZ, Augusto YV5AW, Gustavo YV5DRM, Coisme Gomez, Sven SM5CGA/YV5, Jaime HK9ASC/YV5, and this writer.

The foreign amateurs to operate from Venezuela number around 20. Some of them are Erwin OA4AJU/YV5, Mirella OA4ANS/YV5, Alfonso OA4APQ/YV5, Maria Isabel OA4CRK/YV5, James WD8AMY/YV6, Henry W8PLV/YV5, Rainer DL2GG/YV5, Sven SM4CGA/YV5, Claudio TI4CAM/YV5, Claudio LU5DND/YV5, and this writer.

COMMEMORATIVE AWARD OF 50TH ANNIVERSARY OF VENEZUELAN RADIO CLUB

Sponsored by Radio Club Venezolano, it will be granted to any amateur radio station which fulfills the rules.

Gold Endorsement Award

Application: No QSL cards but a log of contacts with twenty different Venezuelan stations with a maximum of three per call area plus one contact with radio club station YV5AJ. The application must be accompanied with a sworn declaration of rules fulfillment.

Silver Endorsement Award

Application: No QSL cards but a log of contacts with ten different Venezuelan stations plus one contact with radio club station YV5AJ. The application must be accompanied with a sworn declaration of rules fulfillment.

Time period: May 1, 1983, 0001 GMT to January 30, 1984, 2400 GMT; bands: 160, 80, 40, 20, 15, 10; modes: either SSB or CW or both; closing date: logs should be mailed before and no later than March 1st, 1984.

Award fee is four IRCs for postage and handling. Send to Radio Club Venezolano, PO Box 2285, Caracas 1010-A, Venezuela.

WEST GERMANY

Ralph Beyer DJ3NW
Opferkamp 14
3300 Braunschweig
Federal Republic of Germany

GUENTER SCHWARZBECK DL1BU

Everybody knows the symptoms of deciding on a new piece of equipment: self-conviction that something new has to be acquired, enthusiasm afterwards about the number of choices on hand, study of the manufacturer's specifications, consultations with friends, and maybe a hands-on test. But, irresistibly, uncertainty about the right decision develops during this process and one realizes how much subjective data and how little objective data one has for the decision to be made. And, in fact, can one really expect that the manufacturer will tell us about the birdies in his new transceiver, the effect of the switch-selectable preamplifier on the 3rd order intercept point, or the difference of antenna gains for competitive products under identical test conditions? And the statement, "Gain and F/B ratio cannot be published in *QST*," adds to the confusion of consumers rather than stimulating the publication of objective and comparable performance data.

It was most fortunate, therefore, that Guenter Schwarzbeck DL1BU began a series of test reports on radio equipment and antennas in the German *CQ-DL* magazine about 8 years ago. Since that time, he has gained a reputation for his test reports, and not only in Germany. Being a professional in electrical engineering and an avid ham for more than 45 years, he has set up a laboratory with a whole range of test and measurement instruments for this purpose (see photo). The framework of his test procedures and a thorough discussion of his measuring methods were published monthly in the *CQ-DL* magazines July through October, 1976, and in June, 1977. In the past, test reports appeared on (among other things) the Astro 150, IC-730, FT-ONE, TS-930S transceivers, the Datong FL2 filter, coaxial switches and relays, a comparison of the QSK features of Ten-Tec, Cubic, and Drake equipment, and the TH6DXX, TH3MK3, KT34, KT34X, FB33, and FB53 antennas.

In the beginning, Guenter wrote a number of articles about the physics of ham radio and equipment and propagation, too. But since then, more and more emphasis has been placed on the new transceivers and antennas appearing on the market. Today he is practically drowning in equipment offered to him for testing. And he considers it a challenging task not only to produce unambiguous measurements, but also to publish them in a way that is understandable and meaningful for

Guenter Schwarzbeck DL1BU in his test shack. About a third of his test equipment is shown. (Photo by Kurt Goldberger)

the average reader. The toughest job, however, he thinks, is the evaluation of HF antennas. Not because of the physics involved, but due to the sometimes misleading information given by some manufacturers and the nonobjective, emotional attitudes expressed towards certain types of antennas.

Most of his publications are written in German, but casual translations, for example in the British *RadCom* magazine, are spreading the word around. Due to the growing interest in his work on the international level, Guenter is looking for opportunities to publish his reports more regularly in an English-language magazine. In order to leave him some time for his other hobbies—like high-speed CW, including contests (most of which he wins), discussing technical topics, and rag-chewing with friends—a more regular cooperation with a technical translator and fellow ham probably would serve the needs of his international audience best.

If you are interested, you may contact him by mail (8901 Schoenau-Altneudorf, Federal Republic of Germany) or meet him on 14317 kHz Sundays around 0800 hours UTC in the DL/VK net. Although he is a high-speed CW man, he can be heard there quite often now ... since he got a mike a few years ago.

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RG58U 80% shield.....07¢/ft.
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RG59U 100% foil shield, TV type.....$7/100 ft. 10¢/ft.
RG8U 97% shield 11 ga. (equiv. Belden 8214).....31¢/ft.
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Models LNA( ), P30, and P432 shown

Model	Tunable Freq Range	Noise Figure	Gain	Price
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LNA 50	40-70	0.9 dB	20 dB	$39.95
LNA 144	120-180	1.0 dB	18 dB	$39.95
LNA 220	180-250	1.0 dB	17 dB	$39.95
LNA 432	380-470	1.0 dB	18 dB	$44.95

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- P30W, VHF Wired/Tested $29.95
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- P432C, UHF Kit with case $24.95
- P432W, UHF Wired/Tested $33.95

P432 also available in broadband version to cover 20-650 MHz without tuning. Same price as P432; add "B" to model #.

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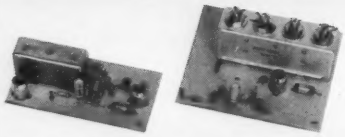

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Model	Tuning Range	Price
HRA-144	143-150 MHz	$49.95
HRA-220	213-233 MHz	$49.95
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	Antenna Input Range	Receiver Output
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	50-52	28-30
Kit $44.95	50-54	144-148
Less Case $39.95	144-146	28-30
Wired $59.95	145-147	28-30
	144-144.4	27-27.4
	146-148	28-30
	144-148	50-54
	220-222	28-30
	220-224	144-148
	222-226	144-148
	220-224	50-54
	222-224	28-30
UHF MODELS	432-434	28-30
	435-437	28-30
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	Exciter Input Range	Antenna Output
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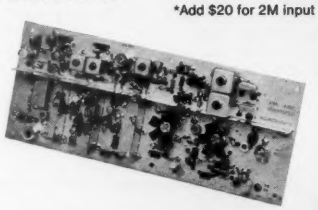
Model XV2	28-29	145-146
Kit $79.95	28-30	50-52
Wired $119.95	27-27.4	144-144.4
(Specify band)	28-30	220-222*
	50-54	220-224
	144-146	50-52
	50-54	144-148
	144-146	28-30
For UHF,	28-30	432-434
Model XV4	28-30	435-437
Kit $99.95	50-54	432-436
Wired $149.95	61.25	439.25
	144-148	432-436*

*Add $20 for 2M input



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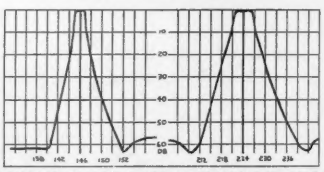
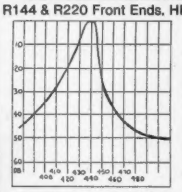
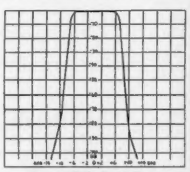


R144 & R220 Front Ends. HRA 144/220, & HRF-144/220

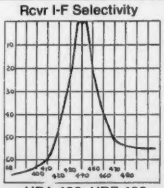


R451 Receiver Front End



Rcvr I-F Selectivity

Typical Selectivity Curves of Receivers and Helical Resonators.



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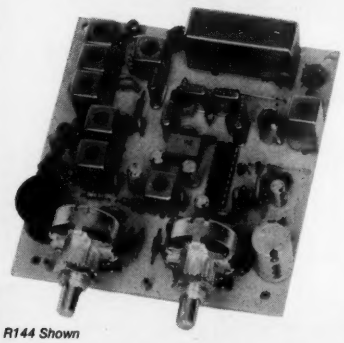

R144 Shown

- **R144/R220 FM RCVRS** for 2M or 220 MHz. 0.15uV sens.; 8 pole xtal filter & ceramic filter in i-f, helical resonator front end for exceptional selectivity (curves at left). AFC incl., xtal oven avail. Kit only $119.95
- **R451 FM RCVR** Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $119.95.
- **R76 FM RCVR** for 10M, 6M, 2M, 220, or commercial bands. As above, but w/o AFC or hel. res. Kits only $109.95. Also avail w/4 pole filter, only $94.95/ kit.
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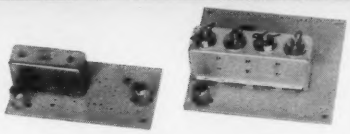

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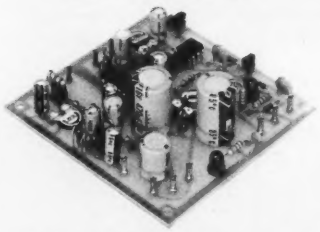
  (See selectivity curves at left.)



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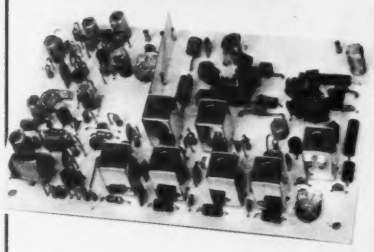

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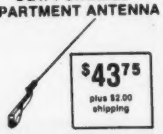

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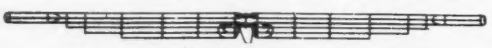

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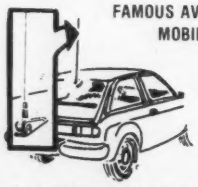

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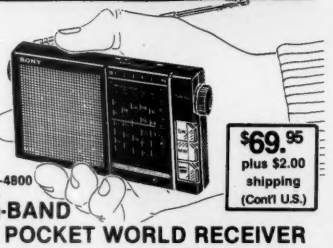

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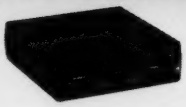


9 DIGITS 600 MHz $129.95 WIRED

The CT-90 is the most versatile, feature packed counter available for less than $300.00! Advanced design features include; three selectable gate times, nine digits, gate indicator and a unique display hold function which holds the displayed count after the input signal is removed! Also, a 10mHz TCXO time base is used which enables easy zero beat calibration checks against WWV. Optionally; an internal nicad battery pack, external time base input and Micro-power high stability crystal oven time base are available. The CT-90, performance you can count on!

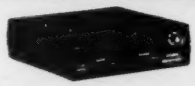
SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 10 MV to 150 MHz Less than 50 MV to 500 MHz
Resolution:	0.1 Hz (10 MHz range) 1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	9 digits 0.4" LED
Time base:	Standard-10.000 mHz, 1.0 ppm 20-40°C. Optional Micro-power oven-0.1 ppm 20-40°C
Power:	8-15 VAC @ 250 ma

PRICES:

CT-90 wired, 1 year warranty	$129.95
CT-90 Kit, 90 day parts warranty	109.95
AC-1 AC adapter	3.95
BP-1 Nicad pack +AC Adapter/Charger	12.95
OV-1, Micro-power Oven time base	49.95
External time base input	14.95

7 DIGITS 525 MHz $99.95 WIRED



SPECIFICATIONS:

Range:	20 Hz to 525 MHz
Sensitivity:	Less than 50 MV to 150 MHz Less than 150 MV to 500 MHz
Resolution:	1.0 Hz (5 MHz range) 10.0 Hz (50 MHz range) 100.0 Hz (500 MHz range)
Display:	7 digits 0.4" LED
Time base:	1.0 ppm TCXO 20-40°C
Power:	12 VAC @ 250 ma

The CT-70 breaks the price barrier on lab quality frequency counters. Deluxe features such as; three frequency ranges - each with pre-amplification, dual selectable gate times, and gate activity indication make measurements a snap. The wide frequency range enables you to accurately measure signals from audio thru UHF with 1.0 ppm accuracy - that's .0001%! The CT-70 is the answer to all your measurement needs, in the field, lab or ham shack.

PRICES:

CT-70 wired, 1 year warranty	$99.95
CT-70 Kit, 90 day parts warranty	84.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC adapter/charger	12.95

7 DIGITS 500 MHz $79.95 WIRED

PRICES:

MINI-100 wired, 1 year warranty	$79.95
AC-Z Ac adapter for MINI-100	3.95
BP-Z Nicad pack and AC adapter/charger	12.95

Here's a handy, general purpose counter that provides most counter functions at an unbelievable price. The MINI-100 doesn't have the full frequency range or input impedance qualities found in higher price units, but for basic RF signal measurements, it can't be beat! Accurate measurements can be made from 1 MHz all the way up to 500 MHz with excellent sensitivity throughout the range, and the two gate times let you select the resolution desired. Add the nicad pack option and the MINI-100 makes an ideal addition to your tool box for "in-the-field" frequency checks and repairs.

SPECIFICATIONS:

Range:	1 MHz to 500 MHz
Sensitivity:	Less than 25 MV
Resolution:	100 Hz (slow gate) 1.0 KHz (fast gate)
Display:	7 digits, 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	5 VDC @ 200 ma

8 DIGITS 600 MHz $159.95 WIRED

NEW READ RECEIVER FREQUENCY

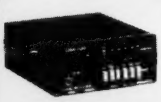
SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 25 mv to 150 MHz Less than 150 mv to 600 MHz
Resolution:	1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	8 digits 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	110 VAC or 12 VDC

The CT-50 is a versatile lab bench counter that will measure up to 600 MHz with 8 digit precision. And, one of its best features is the Receive Frequency Adapter, which turns the CT-50 into a digital readout for any receiver. The adapter is easily programmed for any receiver and a simple connection to the receiver's VFO is all that is required for use. Adding the receiver adapter in no way limits the operation of the CT-50, the adapter can be conveniently switched on or off. The CT-50, a counter that can work double-duty!

PRICES:

CT-50 wired, 1 year warranty	$159.95
CT-50 Kit, 90 day parts warranty	119.95
RA-1, receiver adapter kit	14.95
RA-1 wired and pre-programmed (send copy of receiver schematic)	29.95



DIGITAL MULTIMETER $99.95 WIRED

PRICES:

DM-700 wired, 1 year warranty	$99.95
DM-700 Kit, 90 day parts warranty	79.95
AC-1, AC adaptor	3.95
BP-3, Nicad pack +AC adapter/charger	19.95
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The DM-700 offers professional quality performance at a hobbyist price. Features include; 26 different ranges and 5 functions, all arranged in a convenient, easy to use format. Measurements are displayed on a large 3½ digit, ½ inch LED readout with automatic decimal placement, automatic polarity, overrange indication and overload protection up to 1250 volts on all ranges, making it virtually goof-proof! The DM-700 looks great, a handsome, jet black, rugged ABS case with convenient retractable tilt bail makes it an ideal addition to any shop.

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DC/AC current:	0.1uA to 2.0 Amps, 5 ranges
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Baltimore/Washington

Avantek transistors, amplifiers, oscillators and LNAs. Coaxial cable and connectors. Blonder Tongue dealer with Microwave laboratory. **Applied Specialties, Inc., 10101G Bacon Drive, Beltsville, Maryland 20705. Wash. 595-5393, Balt. 792-2211. 7:30 a.m. to 6:00 p.m. Monday thru Friday.**

DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the Dec. '83 issue must be in our hands by Oct. 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	3A	7	14	14A	14A	14A	
ARGENTINA	14A	14	7	7	7	7A	14A	21A	21A	21A	21A	21A
AUSTRALIA	21A	14	7B	7B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	14A	14	7	7	7	7	14	21	21	21A	21A	21
ENGLAND	7	7	3A	3A	7	7A	14	21	21A	21	14	7
HAWAII	21	14	7	7B	7	7	7	7B	14	21	21	21A
INDIA	7	7B	7B	7B	7B	7B	14	14A	14A	14B	14B	7B
JAPAN	14	7B	7B	7B	7B	7	7	7B	7B	7B	14B	21
MEXICO	14A	7A	7	7	7	7	7A	14A	21	21A	21A	21
PHILIPPINES	14	7B	7B	7B	7B	7B	7B	7B	14B	14B	14B	21
PUERTO RICO	14	7	7	7	7	7	14	21	21A	21A	21A	14A
SOUTH AFRICA	14	14	7	7	7B	14	21	21A	21A	21A	21A	14A
U. S. S. R.	7	7	3A	3A	7	7	14	21A	21A	14	7B	7
WEST COAST	14A	14	7	7	7	7	7	14	21	21A	21A	21

CENTRAL UNITED STATES TO:

ALASKA	14A	14	7	7	7	7	3A	7	14	14A	14A	21
ARGENTINA	21	14	7	7	7	7	7A	21A	21A	21A	21A	21A
AUSTRALIA	21A	14	7B	7B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	14A	14	7	7	7	7	7A	14A	21	21A	21A	21
ENGLAND	7	7	3A	3A	7	7	14	14A	21A	21	14	7
HAWAII	21A	14A	7	7B	7	7	7	7	14	21	21	21A
INDIA	14B	14B	7B	7B	7B	7B	7B	14	14	14B	14B	7B
JAPAN	14A	14	7B	7B	7B	7	7	7	7B	7B	14	21
MEXICO	14A	7A	7	7	7	7	7	14	21	21	21	21
PHILIPPINES	21	14	7B	7B	7B	7B	7B	7B	14B	14	14	21
PUERTO RICO	14A	14	7	7	7	7	14	21	21	21A	21A	21
SOUTH AFRICA	14	14	7	7B	7B	7B	14	21	21	21A	21A	14A
U. S. S. R.	7B	7	3A	3A	7	7B	7B	14	21	14	7B	7B

WESTERN UNITED STATES TO:

ALASKA	14A	14	7	7	7	7	3A	7	7A	14	14A	21
ARGENTINA	21A	14	7	7	7	7	7B	14A	21A	21A	21A	21A
AUSTRALIA	21A	21A	14A	14	14B	7B	7B	7B	14	14	21	21A
CANAL ZONE	14A	14	7	7	7	7	7	14A	21	21A	21A	21A
ENGLAND	7B	7	3A	3A	7	7	7B	14B	14	21	14	7B
HAWAII	21A	21	14	14	7	7	7	7	14	21	21	21A
INDIA	14	14	7B	7B	7B	7B	7B	7B	14	14B	14B	14B
JAPAN	21A	21	14	7B	7B	7	7	7	7	7B	14	21A
MEXICO	14A	14	7	7	7	7	7	14	21	21	21A	21A
PHILIPPINES	21A	21	14	7B	7B	7B	7	7	14	14	14	21
PUERTO RICO	21	14	7	7	7	7	7A	21	21A	21A	21A	21A
SOUTH AFRICA	14	14	7	7B	7B	7B	7B	14	21	21A	21A	14A
U. S. S. R.	7B	7B	3A	3A	7B	7B	7B	14B	14	14B	7B	7B
EAST COAST	14A	14	7	7	7	7	7	14	21	21A	21A	21

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

OCTOBER

SUN	MON	TUE	WED	THU	FRI	SAT
						1 F/G
2 F/G	3 F/G	4 F/F	5 F/F	6 G/G	7 G/G	8 G/G*
9 F/F*	10 P/P#	11 P/F	12 F/G	13 G/G	14 G/G	15 G/G
16 G/G	17 F/G	18 F/G	19 F/F	20 G/G	21 G/G	22 G/G
23 F/F 30P/P#	24 P/F 31 P/P#	25 F/F	26 G/G	27 G/G	28 F/G	29 F/G*

MEET THE NEW YAESU FT-102

The FT-102 is factory equipped for operation on all present and proposed Amateur HF bands. An extra AUX band position is available for special applications. Equipped for SSB, CW, and AM (RX), the FT-102 may be activated on FM and AM (TX) via the optional AM/FM-102 Module.

The all-new receiver front end utilizes a low-distortion RF preamplifier that may be by-passed via a front panel switch when not needed. Maximum receiver performance is yours with this impressive lineup of standard features: IF Notch Filter, Audio Peak Filter, Variable IF Bandwidth Control, IF Shift, Variable Pulse Width Noise Blanker, Independent SSB and CW Audio Channels with Optimized Audio Bandwidth, and Front Panel Audio Tone Control. Wide/Narrow filter selection is independent of the Mode switch.

The celebrated transmitter section is powered by three 6146B final tubes, for more consistent power output and very low distortion. An RF Speech Processor, Mic Amp Audio Tone Control, VOX, and an IF Monitor round out the transmitter lineup.

Futuristic panel design and careful human engineering are the hallmarks of the FT-102. Convenient pop-out controls below the meters may be retracted when not in use, thus avoiding inadvertant mistuning. Abundant relay contacts, rear panel phono jacks for PTT, microphone/patch input, and other essential interface connections make the FT-102 extremely simple to incorporate into your station.

SPECIFICATIONS

TRANSMITTER

Power Input: (1.8-25 MHz) (28-29.9 MHz)

SSB, CW	240W DC	160W DC
AM	80W DC	80W DC
FM		160W DC

RECEIVER

Image Rejection:
Better than 70dB from 1.8-21.5 MHz
Better than 50dB from 24.5-29.9 MHz

IF rejection:
Better than 70 dB

Selectivity (−6 dB/ −60 dB):
SSB, CW, AM; 2.7/4.8 kHz (with no optional filters)
Width adjusts continuously from 2.7 kHz to 500 Hz (−6 dB)

Spurious Radiation: Better than −40 dB

SP-102 FT-102 FV-102DM FC-102

SP-102

The SP-102 External Speaker/Audio Filter features a large, high-fidelity speaker with selectable low- and high-cut audio filters. The front panel A-B switch allows selection of two receiver inputs for maximum versatility. Also available is the SP-102P Speaker/Patch.

See your Authorized Yaesu Dealer today for a hands-on demonstration of the rig that everybody's talking about. It's the FT-102, The Transceiver of Champions!

Price And Specifications Subject To Change Without Notice or Obligation 1082R ~83

FV-102DM

The FV-102DM Synthesized External VFO tunes in 10 Hz steps. Keyboard entry of frequencies, UP/DOWN scanning, and 12 memories make the FV-102DM a "must" for serious DX or contest work.

FC-102

The FC-102 Antenna Coupler is capable of handling 1.2KW of transmitter power, with an in-line wattmeter, separate SWR meter, and A-B input/output selection expanding your station's capability. The optional FAS-1-4R allows remote selection of up to four antennas via one coaxial cable connected to the FC-102.

YAESU **ELECTRONICS CORPORATION** 6851 Walthall Way, Paramount, CA 90723 (213) 633-4007
CINCINNATI SERVICE CENTER 9070 Gold Park Drive, Hamilton, OH 45011 (513) 874-3100

Scan the World.

NEW

SSB, CW, AM, FM, digital VFO's, 10 memories, band and memory scan, optional 118-174 MHz coverage...

R-2000

The R-2000 is an innovative all-mode SSB, CW, AM, FM receiver that covers 150 kHz–30 MHz, with an optional VC-10 VHF converter unit to provide coverage of the 118-174 MHz frequency range. New microprocessor controlled operating features and an "UP" conversion PLL circuit assure maximum flexibility and ease of operation to enhance the excitement of listening to stations around the world.

R-2000 FEATURES:

- **Covers 150 kHz–30 MHz in 30 bands.** Uses innovative UP-conversion digitally controlled PLL circuit. UP/DOWN band switches (1-MHz step). VFO's continuously tuneable across the band and from band to band.
- **Optional 118-174 MHz coverage.** Through use of innovative microprocessor technology, frequency, band, and mode data of stations in the 118-174 MHz range may be tuned, displayed (full frequency, ie., 146.000.0), stored in memory, recalled, and scanned, using the R-2000 front panel controls and frequency display, allowing maximum convenience and ease of operation.
  The optional VC-10 VHF converter unit may be easily installed on the rear panel of the R-2000.
- **All mode: USB, LSB, CW, AM, FM.** Provides expanded flexibility in receiving various signal types. Front panel mode selector keys, with LED indicators.
- **Digital VFO's for best stability.** 50-Hz step, switchable to 500-Hz or 5-kHz. F. LOCK switch provided.
- **Ten memories store frequency, band, and mode data.** Complete information on frequency, band, and mode is stored in memory, assuring maximum ease of operation. Each memory may be tuned as a VFO. Original memory frequency may be recalled. AUTO. M switch for automatic storage of current operating data, or, when off, selective storage of data using M. IN switch.
- **Lithium battery memory back-up. (Est. 5 yr. life.)**
- **Programmable memory scan.** Scans all memories, or may be programmed to scan specific memories. HOLD switch interrupts scanning. Frequency, band, and mode are automatically selected in accordance with the memory channel being scanned. The scanning time is approximately 2 seconds per channel.
- **Programmable band scan.** Scans automatically within the programmed bandwidth. Memory channels 9 and 0 establish upper and lower scan limits. HOLD switch interrupts scanning. Frequency may be adjusted, using the tuning control, during scan HOLD.
- **Fluorescent tube digital display (100-Hz resolution).** Built-in 7 digit fluorescent tube digital display indicates frequency or time, plus memory channel number. DIM switch provided. The display may be switched to indicate CLOCK-2, FREQUENCY, CLOCK-1, and timer ON or OFF by the front panel FUNCTION switch.
- **Dual 24-hour quartz clocks, with timer.**
- **Three built-in IF filters with NARROW/WIDE selector switch. (CW filter opt.)** 6-kHz wide or 2.7-kHz narrow on AM. 2.7-kHz automatic on SSB. 2.7-kHz wide on CW, or, with optional YG-455C filter installed, 500-Hz narrow. 15-kHz automatic on FM.
- **Squelch circuit, all mode, built-in, with BUSY indicator.**
- **Noise blanker built-in.**
- **Large front mounted speaker.**
- **Tone control.**
- **RF step attenuator. (0-10-20-30 dB.)** Four step attenuator, plus antenna fuse.
- **AGC switch. (Slow-Fast.)**
- **"S" meter, with SINPO "S" scale.**
- **100/120/220/240 VAC, or 13.8 VDC operation** (with opt. DCK-1 cable kit).

Other features.

- RECORD output jack.
- Audible "beeper" (through speaker).
- Carrying handle.
- Headphone jack.
- External speaker jack.

Optional accessories:

- VC-10 118-174 MHz converter.
- HS-4, HS-5, HS-6, HS-7 headphones.
- DCK-1 DC cable kit.
- YG-455C 500-Hz CW filter.
- HC-10 World digital quartz clock.
- AL-2 Surge Shunt

More information on the R-2000 is available from all authorized dealers of Trio-Kenwood Communications
1111 West Walnut Street
Compton, California 90220.

KENWOOD

...pacesetter in amateur radio

Specifications and prices are subject to change without notice or obligation.